Student Handbook

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Extra Practice

Extra Practice Chapter 1 ■ Skills Practice

Lesson 1-1

Give two ways to write each algebraic expression in words. 1–4. See Additional Answers.

1. $x + 8$
2. $6(y)$
3. $g - 4$
4. $\frac{12}{h}$

Evaluate each expression for $a = 4$, $b = 2$, and $c = 5$.

5. $b + c$ 7
6. $\frac{a}{b}$ 2
7. $c - a$ 1
8. ab 8

Write an algebraic expression for each verbal expression. Then evaluate the algebraic expression for the given values of y.

	Verbal	Algebraic	$y = 9$	$y = 6$
9.	y reduced by 4	$y - 4$	5	2
10.	the quotient of y and 3	$y \div 3$	3	2
11.	5 more than y	$y + 5$	14	11
12.	the sum of y and 2	$y + 2$	11	8

Lesson 1-2

Solve each equation. Check your answer.

13. $x - 9 = 5$ 14
14. $4 = y - 12$ 16
15. $a + \frac{3}{5} = 7$ $6\frac{2}{5}$
16. $7.3 = b + 3.4$ 3.9
17. $-6 + j = 5$ 11
18. $-1.7 = -6.1 + k$ 4.4

Write an equation to represent each relationship. Then solve the equation.

19. A number decreased by 7 is equal to 10. $x - 7 = 10$; $x = 17$
20. The sum of 6 and a number is −3. $6 + x = -3$; $x = -9$

Lesson 1-3

Solve each equation. Check your answer.

21. $\frac{n}{5} = 15$ 75
22. $-6 = \frac{k}{4}$ −24
23. $\frac{r}{2.6} = 5$ 13
24. $3b = 27$ 9
25. $56 = -7d$ −8
26. $-3.6 = -2f$ 1.8
27. $\frac{1}{4}z = 3$ 12
28. $12 = \frac{4}{5}g$ 15
29. $\frac{1}{3}a = -5$ −15

Write an equation to represent each relationship. Then solve the equation.

30. A number multiplied by 4 is −20. $4x = -20$; $x = -5$
31. The quotient of a number and 5 is 7. $\frac{x}{5} = 7$; $x = 35$

Lesson 1-4

Solve each equation. Check your answer.

32. $2k + 7 = 15$ 4
33. $11 - 5m = -4$ 3
34. $23 = 9 - 2d$ −7
35. $\frac{2}{5}b + 6 = 10$ 10
36. $\frac{f}{3} - 4 = 2$ 18
37. $6n + 4 = 22$ 3

Write an equation to represent each relationship. Solve each equation.

38. The difference of 11 and 4 times a number equals 3. $11 - 4x = 3$; $x = 2$
39. Thirteen less than 5 times a number is equal to 7. $5x - 13 = 7$; $x = 4$

Extra Practice Chapter 1 ■ Skills Practice

Lesson 1-5

Solve each equation. Check your answer.

40. $5b - 3 = 4b + 1$ 4
41. $3g + 7 = 11g - 17$ 3
42. $-8 + 4y = y - 6 + 3y - 2$ all real numbers
43. $7 + 3d - 5 = -1 + 2d - 12 + d$ no solutions

Write an equation to represent each relationship. Then solve the equation.

44. Three more than one-half a number is the same as 17 minus three times the number.
45. Two times the difference of a number and 4 is the same as 5 less than the number.

32, 33. See Additional Answers.

Lesson 1-6

Solve each equation for the indicated variable.

46. $q - 3r = 2$ for r $r = \frac{2 - q}{-3}$
47. $\frac{5 - c}{6} = d - 7$ for c $c = -6d + 47$
48. $2x + 3\frac{y}{4} = 5$ for y $y = \frac{20 - 8x}{3}$
49. $2fgh - 3g = 10$ for h $h = \frac{10 + 3g}{2fg}$

Lesson 1-7

Solve each equation. Check your answer.

50. $|a| = 13$ ±13
51. $|x| - 16 = 3$ ±19
52. $|g + 5| = 11$ −16, 6
53. $|7s| - 6 = 8$ ±2
54. $\left|\frac{f}{2} + 1\right| = 15$ −32, 28
55. $|p - 5| - 12 = -9$ 2, 8
56. $500 = 25|z| + 200$ ±12
57. $|7j + 14| - 5 = 16$ −5, 1
58. $\frac{|p - 2| - 15}{5} = -1$ −8, 12

Lesson 1-8

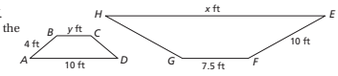
59. A car traveled 210 miles in 3 hours. Find the unit rate in miles per hour. 70 mi/h
60. A printer printed 60 pages in 5 minutes. Find the unit rate in pages per minute. 12 pages/min

Solve each proportion.

61. $\frac{h}{4} = \frac{5}{6}$ $\frac{10}{3}$
62. $\frac{5}{m} = \frac{2}{5}$ $\frac{25}{2}$
63. $\frac{r}{3} = \frac{10}{7}$ $\frac{30}{7}$
64. $\frac{2}{3} = \frac{2x}{8}$ $\frac{8}{3}$
65. $\frac{5}{x - 3} = \frac{3}{10}$ $\frac{59}{3}$
66. $\frac{b - 2}{4} = \frac{7}{12}$ $\frac{13}{3}$

Lesson 1-9

67. In the diagram, $ABCD \sim EFGH$. Find (a) the value of x and (b) the value of y. $x = 25$, $y = 3$



Lesson 1-10

Choose the more precise measurement in each pair.

68. 7.25 lb; 7 lb
69. 11 in.; 11.6 inches
70. 3.3 cm; 3.28 cm
71. 5.6 cm; 55.8 mm
72. 1372 mg; 1.4 g
73. 1100 m; 1 km
74. Scale A measures a mass of exactly 12.000 ounces to be 12.015 ounces. Scale B measures the mass to be 12.02 ounces. Which scale is more precise? Which is more accurate? Scale A; Scale B

Write the possible range of each measurement. Round to the nearest hundredth if necessary.

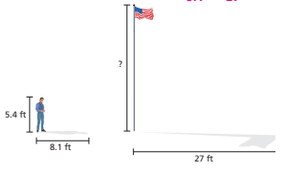
75. 10 mg ± 0.5% 9.95 mg–10.05 mg
76. 15 cm ± 1% 14.85 cm–15.15 cm
77. 80 lb ± 0.2% 79.84 lb–80.16 lb

Extra Practice Chapter 1 ■ Applications Practice

Biology Use the following information for Exercises 1 and 2.

In general, skin cells in the human body contain 46 chromosomes. *(Lesson 1-1)*

1. Write an expression for the number of chromosomes in c skin cells. $46c$
2. Find the number of chromosomes in 8, 15, and 50 skin cells. 368; 690; 2300
3. **Economics** In 2004, the average price of an ounce of gold was $47 more than the average price in 2003. The 2004 price was $410. Write and solve an equation to find the average price of an ounce of gold in 2003. *(Lesson 1-2)* $x + 47 = 410$; $363
4. During a renovation, 36 seats were removed from a theater. The theater now seats 580 people. Write and solve an equation to find the number of seats in the theater before the renovation. *(Lesson 1-2)* $x - 36 = 580$; 616
5. A case of juice drinks contains 12 bottles and costs $18. Write and solve an equation to find the cost of each drink. *(Lesson 1-2)* $12x = 18$; $1.50
6. **Astronomy** Objects weigh about 3 times as much on Earth as they do on Mars. A rock weighs 42 lb on Mars. Write and solve an equation to find the rock's weight on Earth. *(Lesson 1-2)* $42 = \frac{1}{3}x$; 126 lb
7. The county fair's admission fee is $8 and each ride costs $2.50. Sonia spent a total of $25.50. How many rides did she go on? *(Lesson 1-4)* 7
8. At the beginning of a block party, the temperature was 84°. During the party, the temperature dropped 3° every hour. At the end of the party, the temperature was 66°. How long was the party? *(Lesson 1-4)* 6 hours
9. **Consumer Economics** A health insurance policy costs $700 per year, plus $15 for each visit to the doctor's office. A different plan costs $560 per year, but each office visit is $50. Find the number of office visits for which the two plans have the same total cost. *(Lesson 1-5)* 4
10. **Geometry** The formula $A = \frac{1}{2}bh$ gives the area A of a triangle with base b and height h. *(Lesson 1-6)*
    a. Solve $A = \frac{1}{2}bh$ for h. $h = \frac{2A}{b}$
    b. Find the height of a triangle with an area of 30 square feet and a base of 6 feet. 10 ft
11. Charles is hanging a poster on his wall. He wants the top of the poster to be 84 inches from the floor but would be happy for it to be 3 inches higher or lower. Write and solve an absolute-value equation to find the maximum and minimum acceptable heights. *(Lesson 1-7)* $|x - 84| = 3$; 87 in.; 81 in.
12. The ratio of students to adults on a school trip is 9:2. There are 6 adults on the trip. How many students are there? *(Lesson 1-8)* 27
13. A cheetah can reach speeds of up to 103 feet per second. Use dimensional analysis to convert the cheetah's speed to miles per hour. Round to the nearest tenth. *(Lesson 1-8)* 70.2 mi/h
14. Write and solve a proportion to find the height of the flagpole. *(Lesson 1-9)* $\frac{5.4}{8.1} = \frac{x}{27}$; 18 ft



15. **Coins** Alex and Aretha found the mass of a half dollar coin with an exact mass of 11.340 g. Alex's measure was 11.3 g. Aretha's was 11.338 g. Whose measure was more precise? Whose is more accurate? *(Lesson 1-10)* Aretha; Aretha
16. **Manufacturing** The weight of a box of Wheat Treats cereal is 16 oz with a tolerance of 0.2 oz. Is a box with a weight of 15.85 oz acceptable? Explain. *(Lesson 1-10)* Yes; $|16 - 15.85| = 0.15 < 0.2$

Extra Practice

Extra Practice Chapter 2 ■ Skills Practice 1–5. See Additional Answers.

Lesson 2-1

Describe the solutions of each inequality in words.

1. $3 + v < -2$
2. $15 \leq k + 4$
3. $-3 + n > 6$
4. $1 - 4x \geq -2$

Graph each inequality.

5. $f \geq 2$
6. $m < -1$
7. $\sqrt{4^2 + 3^2} > c$
8. $(-1 - 1)^2 \leq p$

Write the inequality shown by each graph.

9. $x \leq 3$
10. $x > -2$
11. $x < 8$
12. $x \geq -4$
13. $x > -1$
14. $x < 3$

Write each inequality with the variable on the left. Graph the solutions.

15. $14 > b$ $b < 14$
16. $9 \leq g$ $g \geq 9$
17. $-2 < x$ $x > -2$
18. $-4 \geq k$ $k \leq -4$

Lesson 2-2

Solve each inequality and graph the solutions.

19. $8 \geq d - 4$ $d \leq 12$
20. $-5 < 10 + w$ $w > -15$
21. $a + 4 \leq 7$ $a \leq 3$
22. $9 + j > 2$ $j > -7$

Write an inequality to represent each statement. Solve the inequality and graph the solutions.

23. Five more than a number v is less than or equal to 9. $v + 5 \leq 9$; $v \leq 4$
24. A number t decreased by 2 is at least 7. $t - 2 \geq 7$; $t \geq 9$
25. Three less than a number r is less than -1. $r - 3 < -1$; $r < 2$
26. A number k increased by 1 is at most -2. $k + 1 \leq -2$; $k \leq -3$

Use the inequality $4 + z \leq 11$ to fill in the missing numbers.

27. $z \leq$ 7
28. $z - $ 3 ≤ 4
29. $z - 3 \leq$ 4

Lesson 2-3

Solve each inequality and graph the solutions.

30. $24 > 4b$ $b < 6$
31. $27g \leq 81$ $g \leq 3$
32. $\frac{x}{5} < 3$ $x < 15$
33. $10y \geq 2$ $y \geq \frac{1}{5}$
34. $4p < -2$ $p < -\frac{1}{2}$
35. $\frac{3s}{8} > 3$ $s > 8$
36. $0 \geq \frac{3}{7}d$ $d \leq 0$
37. $\frac{a}{8} \geq \frac{3}{4}$ $a \geq 6$
38. $-3k \leq -12$ $k \geq 4$
39. $\frac{-2e}{5} \geq 4$ $e \leq -10$
40. $8 < -12y$ $y < -\frac{2}{3}$
41. $-3.5 > 14c$ $c < -\frac{1}{4}$
42. $9 > \frac{h}{-2}$ $h > -18$
43. $49 > -7m$ $m > -7$
44. $60 \leq -12c$ $c \leq -5$
45. $-\frac{1}{3}q < -6$ $q > 18$

Write an inequality for each statement. Solve the inequality and graph the solutions.

46. The product of $\frac{1}{2}$ and a number is not more than 6. $\frac{1}{2}x \leq 6$; $x \leq 12$
47. The quotient of r and -5 is greater than 3. $\frac{r}{-5} > 3$; $r < -15$
48. The product of -11 and a number is greater than -33. $-11x > -33$; $x < 3$
49. The quotient of w and -4 is less than or equal to -6. $\frac{w}{-4} \leq -6$; $w \geq 24$

Extra Practice Chapter 2 ■ Skills Practice 50–58, 63–67, 73–76, 79–86, 90, 91. For graphs, Additional Answers.

Lesson 2-4

Solve each inequality and graph the solutions.

50. $3t - 2 < 5$ $t < \frac{7}{3}$
51. $-6 < 5b - 4$ $b > -\frac{2}{5}$
52. $4 < \frac{2f + 3}{2}$ $f > \frac{5}{2}$
53. $10 \leq 3(4 - r)$ $r \leq \frac{2}{3}$
54. $\frac{2}{3} + \frac{3}{4}h < \frac{4}{3}$ $h < \frac{8}{9}$
55. $\frac{1}{5}(10k - 2) > 1$ $k > \frac{7}{10}$
56. $-n - 3 < -2^3$ $n > 5$
57. $37 - 4d \leq \sqrt{3^2 + 4^2}$ $d \geq 8$
58. $-\frac{3}{4}(8q - 2^2) < -3$ $q > 1$

Use the inequality $-6 - 2w \geq 10$ to fill in the missing numbers.

59. $w \leq$ −8
60. $w - 3 \leq$ −11
61. 9 $+ w \leq 1$

62. See Additional Answers.

Write an inequality for each statement. Solve the inequality and graph the solutions.

62. Twelve is less than or equal to the product of 6 and the difference of 5 and a number.
63. The difference of one-third a number and 8 is more than -4. $\frac{1}{3}x - 8 > -4$; $x > 12$
64. One-fourth of the sum of $2x$ and 4 is more than 5. $\frac{1}{4}(2x + 4) > 5$; $x > 8$

Lesson 2-5

Solve each inequality and graph the solutions.

65. $4v - 2 \leq 3v$ $v \leq 2$
66. $2(7 - s) > 4(s + 2)$ $s < 1$
67. $\frac{1}{3}u - \frac{5}{2} \geq \frac{1}{6}u$ $u \geq 15$

Solve each inequality.

68. $3 + 3c < 6 + 3c$ all real numbers
69. $4(k + 2) \geq 4k + 5$ all real numbers
70. $2(5 - b) \leq 3 - 2b$ no solutions

Write an inequality to represent each relationship. Solve your inequality.

71. The difference of three times a number and 5 is more than the number times 4. $3x - 5 > 4x$; $x < -5$
72. One less than a number is greater than the product of 3 and the difference of 5 and the number. $x - 1 > 3(5 - x)$; $x > 4$

Lesson 2-6

Solve each compound inequality and graph the solutions.

73. $6 < 3 + x < 8$ $3 < x < 5$
74. $-1 \leq b + 4 \leq 3$ $-5 \leq b \leq -1$
75. $k + 5 \leq -3$ OR $k + 5 \geq 1$ $k \leq -8$ OR $k \geq -4$
76. $r - 3 > 2$ OR $r + 1 < 4$ $r > 5$ OR $r < 3$

Write the compound inequality shown by each graph.

77. $x \leq -1$ OR $x \geq 1$
78. $-4 \leq x < 0$

Write and graph a compound inequality for the numbers described.

79. all real numbers less than 2 and greater than or equal to -1 $-1 \leq x < 2$
80. all real numbers between -3 and 1 $-3 < x < 1$

Lesson 2-7

Solve each inequality and graph the solutions.

81. $|n + 5| \leq 26$ $-31 \leq n \leq 21$
82. $|x| + 6 < 13$ $-7 < x < 7$
83. $4|k| \leq 12$ $-3 \leq k \leq 3$
84. $|c - 8| > 18$ $c < -10$ OR $c > 26$
85. $6|p| \geq 48$ $p \leq -8$ OR $p \geq 8$
86. $|3 + t| - 1 \geq 5$ $t \leq -9$ OR $t \geq 3$

Solve each inequality.

87. $|a| - 2 \leq -5$ no solutions
88. $2|w| + 5 < 3$ no solutions
89. $|s| + 12 > 8$ all real numbers

Write and solve an absolute-value inequality for each expression. Graph the solutions on a number line.

90. All numbers whose absolute value is greater than 14. $|x| > 14$; $x < -14$ OR $x > 14$
91. All numbers whose absolute value multiplied by 3 is less than 27. $3|x| < 27$; $-9 < x < 9$

Extra Practice Chapter 2 ■ Applications Practice

1–4, 11, 12. See Additional Answers.

1. At a food-processing factory, each box of cereal must weigh at least 15 ounces. Define a variable and write an inequality for the acceptable weights of the cereal boxes. Graph the solutions. *(Lesson 2-1)*
2. In order to qualify for a discounted entry fee at a museum, a visitor must be less than 13 years old. Define a variable and write an inequality for the ages that qualify for the discounted entry fee. Graph the solutions. *(Lesson 2-1)*
3. A restaurant can seat no more than 102 customers at one time. There are already 96 customers in the restaurant. Write and solve an inequality to find out how many additional customers could be seated in the restaurant. *(Lesson 2-2)*
4. **Meteorology** A hurricane is a tropical storm with a wind speed of at least 74 mi/h. A meteorologist is tracking a storm whose current wind speed is 63 mi/h. Write and solve an inequality to find out how much greater the wind speed must be in order for this storm to be considered a hurricane. *(Lesson 2-2)*

Hobbies **Use the following information for Exercises 5–7.**

When setting up an aquarium, it is recommended that you have no more than one inch of fish per gallon of water. For example, in a 30-gallon tank, the total length of the fish should be at most 30 inches. *(Lesson 2-3)*

Freshwater Fish	
Name	Length (in.)
Red tail catfish	3.5
Blue gourami	1.5

5. Write an inequality to show the possible numbers of blue gourami you can put in a 10-gallon aquarium. $1.5x \leq 10$
6. Find the possible numbers of blue gourami you can put in a 10-gallon aquarium. 0, 1, 2, 3, 4, 5, or 6
7. Find the possible numbers of red tail catfish you can put in a 20-gallon aquarium. 0, 1, 2, 3, 4, or 5
8. The admission fee at an amusement park is $12, and each ride costs $3.50. The park also offers an all-day pass with unlimited rides for $33. For what numbers of rides is it cheaper to buy the all-day pass? *(Lesson 2-4)* greater than 6 rides
9. The table shows the cost of Internet access at two different cafes. For how many hours of access is the cost at Cyber Station less than the cost at Web World? *(Lesson 2-5)* greater than 16 hours

Internet Access	
Cafe	Cost
Cyber Station	$12 one-time membership fee $1.50 per hour
Web World	No membership fee $2.25 per hour

10. Larissa is considering two summer jobs. A job at the mall pays $400 per week plus $15 for every hour of overtime. A job at the movie theater pays $360 per week plus $20 for every hour of overtime. How many hours of overtime would Larissa have to work in order for the job at the movie theater to pay a higher salary than the job at the mall? *(Lesson 2-5)* greater than 8 hours
11. **Health** For maximum safety, it is recommended that food be stored at a temperature between 34 °F and 40 °F inclusive. Write a compound inequality to show the temperatures that are within the recommended range. Graph the solutions. *(Lesson 2-6)*
12. **Physics** Color is determined by the wavelength of light. Wavelengths are measured in nanometers (nm). Our eyes see the color green when light has a wavelength between 492 nm and 577 nm inclusive. Write a compound inequality to show the wavelengths that produce green light. Graph the solutions. *(Lesson 2-6)*
13. Allison ran a mile in 8 minutes. She wants to run a second mile within 0.75 minute of her time for the first mile. Write and solve an absolute-value inequality to find the range of acceptable times for the second mile. *(Lesson 2-7)* $|x - 8| < 0.75$; $7.25 < x < 8.75$

Extra Practice

Extra Practice Chapter 3 ■ Skills Practice

Lesson 3-1

Choose the graph that best represents each situation.

1. A person blows up a balloon with a steady airstream. **B**
2. A person blows up a balloon and then lets it deflate. **A**
3. A person blows up a balloon slowly at first and then uses more and more air. **C**

Lesson 3-2

Express each relation as a table, as a graph, and as a mapping diagram. **4–7. See Additional Answers.**

4. $\{(0, 2), (-1, 3), (-2, 5)\}$
5. $\{(2, 8), (4, 6), (6, 4), (8, 2)\}$

Give the domain and range of each relation. Tell whether the relation is a function. Explain.

6. $\{(3, 4), (-1, 2), (2, -3), (5, 0)\}$
7. $\{(5, 4), (0, 2), (5, -3), (0, 1)\}$
8.

x	2	0	1	2	−1
y	1	0	−1	−2	−3

D: {−1, 0, 1, 2}; R: {−3, −2, −1, 0, 1}; no; the domain value 2 is paired with 1 and −2.

9. **9. See Additional Answers.**

Lesson 3-3

Determine a relationship between the x- and y-variables. Write an equation. **11. See p. x.**

10. $\{(1, 3), (2, 6), (3, 9), (4, 12)\}$ **y is 3 times x; $y = 3x$**
11.

x	1	2	3	4
y	1	4	9	16

Identify the independent and dependent variables. Write an equation in function notation for each situation.

12. A science tutor charges students $15 per hour. **ind.: hours; dep.: cost; $f(h) = 15h$**
13. A circus charges a $10 entry fee and $1.50 for each pony ride. **ind.: number of pony rides; dep.: cost; $f(r) = 10 + 1.5r$**
14. For $f(a) = 6 - 4a$, find $f(a)$ when $a = 2$ and when $a = -3$. **−2; 18**
15. For $g(d) = \frac{2}{5}d + 3$, find $g(d)$ when $d = 10$ and when $d = -5$. **7; 1**
16. For $h(w) = 2 - w^2$, find $h(w)$ when $w = -1$ and when $w = -2$. **1; −2**
17. Complete the table for $f(t) = 7 + 3t$.

t	0	1	2	3
$f(t)$	7	10	13	16

18. Complete the table for $h(s) = 2s + s^3 - 6$.

s	−1	0	1	2
$h(s)$	−9	−6	−3	6

Extra Practice Chapter 3 ■ Skills Practice

Lesson 3-4

Graph each function for the given domain. **19–23. See Additional Answers.**

19. $2x - y = 2$; D: $\{-2, -1, 0, 1\}$
20. $f(x) = x^2 - 1$; D: $\{-3, -1, 0, 2\}$

Graph each function.

21. $f(x) = 4 - 2x$
22. $y + 3 = 2x$
23. $y = -5 + x^2$
24. Use a graph of the function $y = \frac{5}{2} - 2x$ to find the value of y when $x = \frac{1}{2}$. Check your answer. **$\frac{3}{2}$**
25. Find the value of x so that $(x, 4)$ satisfies $y = -x + 8$. **$x = 4$**
26. Find the value of y so that $(-3, y)$ satisfies $y = 15 - 2x^2$. **$y = -3$**

For each function, determine whether the given points are on the graph.

27. $y = \frac{x}{3} + 4$; $(-3, 3)$ and $(3, 5)$ **yes; yes**
28. $y = x^2 - 1$; $(-2, 3)$ and $(2, 5)$ **yes; no**

Lesson 3-5

Describe the correlation illustrated by each scatter plot.

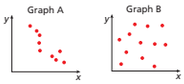
29.
no correlation
30.
neg.
31.
pos.

Identify the correlation you would expect to see between each pair of data sets. Explain.

32. the number of chess pieces captured and the number of pieces still on the board **neg.**
33. a person's height and the color of the person's eyes **no correlation**

Choose the scatter plot that best represents the described relationship. Explain.

34. the number of students in a class and the grades on a test **B**
35. the number of students in a class and the number of empty desks **A**



32–35. For explanations, see Additional Answers.

Lesson 3-6

Determine whether each sequence appears to be an arithmetic sequence. If so, find the common difference and the next three terms.

36. −10, −7, −4, −1, … **yes; $d = 3$; 2, 5, 8**
37. 8, 5, 1, −4, … **no**
38. 1, −2, 3, −4, … **no**
39. −19, −9, 1, 11, … **yes; $d = 10$; 21, 31, 41**

Find the indicated term of each arithmetic sequence.

40. 15th term: −5, −1, 3, 7, … **51**
41. 20th term: $a_1 = 2$; $d = -5$ **−93**
42. 12th term: 8, 16, 24, 32, … **96**
43. 21st term: 5.2, 5.17, 5.14, 5.11, … **4.6**

Find the common difference for each arithmetic sequence.

44. 0, 7, 14, 21, … **7**
45. 132, 121, 110, 99, … **−11**
46. $\frac{1}{4}, 1, \frac{7}{4}, \frac{10}{4}, \ldots$ **$\frac{3}{4}$**
47. 1.4, 2.2, 3, 3.8, … **0.8**
48. −7, −2, 3, 8, … **5**
49. 7.28, 7.21, 7.14, 7.07, … **−0.07**

Find the next four terms in each arithmetic sequence.

50. −3, −6, −9, −12, … **−15, −18, −21, −24**
51. 2, 9, 16, 23, … **30, 37, 44, 51**
52. $-\frac{1}{3}, \frac{1}{3}, 1, \frac{5}{3}, \ldots$ **$\frac{7}{3}, 3, \frac{11}{3}, \frac{13}{3}$**
53. −4.3, −3.2, −2.1, −1, … **0.1, 1.2, 2.3, 3.4**

Extra Practice Chapter 3 ■ Applications Practice

1–4, 7–8. See Additional Answers.

1. Donnell drove on the highway at a constant speed and then slowed down as she approached her exit. Sketch a graph to show the speed of Donnell's car over time. Tell whether the graph is continuous or discrete. *(Lesson 3-1)*
2. Lori is buying mineral water for a party. The bottles are available in six-packs. Sketch a graph showing the number of bottles Lori will have if she buys 1, 2, 3, 4, or 5 six-packs. Tell whether the graph is continuous or discrete. *(Lesson 3-1)*
3. **Health** To exercise effectively, it is important to know your maximum heart rate. You can calculate your maximum heart rate in beats per minute by subtracting your age from 220. *(Lesson 3-2)*
   a. Express the age x and the maximum heart rate y as a relation in table form by showing the maximum heart rate for people who are 20, 30, 35, and 40 years old.
   b. Is this relation a function? Explain.
4. **Sports** The table shows the number of games won by four baseball teams and the number of home runs each team hit. Is this relation a function? Explain. *(Lesson 3-2)*

Season Statistics	
Wins	Home Runs
95	185
93	133
80	140
93	167

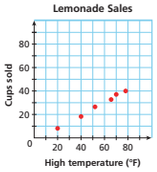
5. Michael uses 5.5 cups of flour for each loaf of bread that he bakes. He plans to bake a maximum of 4 loaves. Write a function to describe the number of cups of flour used. Find a reasonable domain and range for the function. *(Lesson 3-3)*

$f(x) = 5.5x$; D: {0, 1, 2, 3, 4}; R: {0, 5.5, 11, 16.5, 22}

6. A gym offers the following special rate. New members pay a $425 initiation fee and then pay $90 per year for 1, 2, or 3 years. Write a function to describe the situation. Find a reasonable domain and range for the function. *(Lesson 3-3)*

$f(x) = 425 + 90x$; D: {1, 2, 3}; R: {$515, $605, $695}

7. The function $y = 3.5x$ describes the number of miles y that the average turtle can walk in x hours. Graph the function. Use the graph to estimate how many miles a turtle can walk in 4.5 hours. *(Lesson 3-4)*
8. **Earth Science** The Kangerdlugssuaq glacier in Greenland is flowing into the sea at the rate of 1.6 meters per hour. The function $y = 1.6x$ describes the number of meters y that flow into the sea in x hours. Graph the function. Use the graph to estimate the number of meters that flow into the sea in 8 hours. *(Lesson 3-4)*
9. The scatter plot shows a relationship between the number of lemonades sold in a day and the day's high temperature. Based on this relationship, predict the number of lemonades that will be sold on a day when the high temperature is 96 °F. *(Lesson 3-5)* **48**



10. In month 1 the Elmwood Public Library had 85 Spanish books in its collection. Each month, the librarian plans to order 8 new Spanish books. How many Spanish books will the library have in month 15? *(Lesson 3-6)* **197**
11. Nikki purchases a card that she can use to ride the bus in her town. Each time she rides the bus $1.50 is deducted from the value of the card. After her first ride, there is $43.50 left on the card. How much money will be left on the card after Nikki has taken 12 bus rides? *(Lesson 3-6)* **$27**

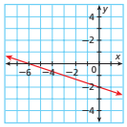
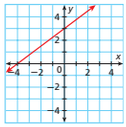
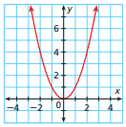
Extra Practice

Extra Practice Chapter 4 ■ Skills Practice

1–7, 9, 10, 14–17. See Additional Answers.

Lesson 4-1

Identify whether each graph represents a function. Explain. If the graph does represent a function, is the function linear?

1. 
2. 
3. 

Tell whether the given ordered pairs satisfy a linear function. Explain.

4.

x	−4	−2	0	2	4
y	7	6	5	4	3

5.

x	2	5	8	11	14
y	12	8	7	3	3

Tell whether each equation is linear. If so, write the equation in standard form and give the values of A, B, and C.

6. $y = 8 - 3x$
7. $\frac{x}{3} = 4 - 2y$
8. $-3 + xy = 2$ no
9. $4x = -3 - 3y$

Lesson 4-2

Find the x- and y-intercepts.

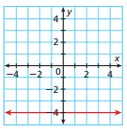
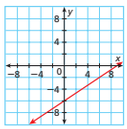
10. $-4x = 2y - 1$
11. $x - y = 3$ x-int.: 3; y-int.: −3
12. $2x - 3y = 12$ x-int.: 6; y-int.: −4
13. $2.5x + 2.5y = 5$ x-int.: 2; y-int.: 2

Use intercepts to graph the line described by each equation.

14. $15 = -3x - 5y$
15. $4y = 2x + 8$
16. $y = 6 - 3x$
17. $-2y = x + 2$

Lesson 4-3

Find the slope of each line.

18.  0
19.  $\frac{2}{3}$

Lesson 4-4

Find the slope of the line that contains each pair of points.

20. $(-1, 2)$ and $(-4, 8)$ −2
21. $(2, 6)$ and $(0, 1)$ $\frac{5}{2}$
22. $(-2, 3)$ and $(4, 0)$ $-\frac{1}{2}$

Find the slope of the line described by each equation.

23. $2y = 42 - 6x$ −3
24. $3x + 4y = 12$ $-\frac{3}{4}$
25. $3x = 15 + 5y$ $\frac{3}{5}$

Lesson 4-5

Tell whether each equation represents a direct variation. If so, identify the constant of variation.

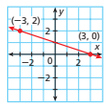
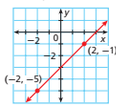
26. $x - 2y = 0$ yes; $\frac{1}{2}$
27. $x - y = 3$ no
28. $3y = 2x$ yes; $\frac{2}{3}$
29. The value of y varies directly with x, and $y = 2$ when $x = -3$. Find y when $x = 6$. −4
30. The value of y varies directly with x, and $y = -3$ when $x = 9$. Find y when $x = 12$. −4

Extra Practice Chapter 4 ■ Skills Practice

37–39. For graphs, See Additional Answers.

Lesson 4-6

Write the equation that describes each line in slope-intercept form.

31. slope = 2, y-intercept = −2 $y = 2x - 2$
32. slope = 0.25, y-intercept = 4 $y = 0.25x + 4$
33. slope = −2, (5, 4) is on the line.
34. slope = $\frac{1}{3}$, (−8, 0) is on the line.
35.  $y = -\frac{1}{3}x + 1$
36.  $y = x - 3$

33. $y = -2x + 14$
34. $y = \frac{1}{3}x + \frac{8}{3}$

Write each equation in slope-intercept form. Then graph the line described by the equation.

37. $2y = x - 3$ $y = \frac{1}{2}x - \frac{3}{2}$
38. $-3x - 2y = 1$ $y = -\frac{3}{2}x - \frac{1}{2}$
39. $2y - \frac{1}{2}x = 2$ $y = \frac{1}{4}x + 1$

Lesson 4-7

Write an equation in point-slope form for the line with the given slope that contains the given point.

40. slope = 2; (0, 3) $y - 3 = 2(x - 0)$
41. slope = −1; (1, −1) $y + 1 = -1(x - 1)$
42. slope = $\frac{1}{2}$; (2, 4) $y - 4 = \frac{1}{2}(x - 2)$

Write the equation that describes each line in slope-intercept form.

43. slope = 3, (−2, −5) is on the line. $y = 3x + 1$
44. (−1, 1) and (1, −2) are on the line. $y = 4x - 11$
45. (3, 1) and (2, −3) are on the line.
46. x-intercept = 4, y-intercept = −5 $y = \frac{5}{4}x - 5$

Your wingspan is the distance between the tips of your middle fingers when your arms are stretched out at your sides. The table shows the wingspans and heights in centimeters of several people.

Wingspan (cm)	158	175	166	171	189
Height (cm)	157	166	169	162	180

47. Find an equation for a line of best. How well does the line fit the data? $y = 0.72x + 42$; very well ($r = 0.93$)
48. Use your equation to predict the height of a person with a wingspan of 184 cm. about 174.5 cm

Lesson 4-8

Write an equation in slope-intercept form for the line that is parallel to the given line and that passes through the given point.

49. $y = -2x + 3$; (1, 4) $y = -2x + 6$
50. $y = x - 5$; (2, −4) $y = x - 6$
51. $y = 3x$; (−1, 5) $y = 3x + 8$

Write an equation in slope-intercept form for the line that is perpendicular to the given line and that passes through the given point.

52. $y = x + 1$; (3, −2) $y = -x + 1$
53. $y = -4x - 1$; (−1, 0) $y = \frac{1}{4}x + \frac{1}{4}$
54. $y = 4x + 5$; (2, −1) $y = -\frac{1}{4}x - \frac{1}{2}$

Lesson 4-9

Graph $f(x)$ and $g(x)$. Then describe the transformation(s) from the graph of $f(x)$ to the graph of $g(x)$. For 57, 58, 60 and all graphs, see Additional Exercises.

55. $f(x) = x$, $g(x) = x + 2$ trans. 2 units up
56. $f(x) = x$, $g(x) = x - \frac{1}{2}$ trans. $\frac{1}{2}$ unit down
57. $f(x) = 6x + 1$, $g(x) = 2x + 1$
58. $f(x) = 3x - 1$, $g(x) = 9x - 1$
59. $f(x) = x$, $g(x) = 2x - 1$ rot., trans. 1 unit down
60. $f(x) = x + 1$, $g(x) = -\frac{1}{2}x$

Extra Practice Chapter 4 ■ Applications Practice

1–5, 6b, 9, and 10. See Additional Answers.

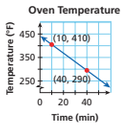
1. Jennifer is having prints made of her photographs. Each print costs $1.50. The function $f(x) = 1.50x$ gives the total cost of the x prints. Graph this function and give its domain and range. *(Lesson 4-1)*

2. The Chang family lives 400 miles from Denver. They drive to Denver at a constant speed of 50 mi/h. The function $f(x) = 400 - 50x$ gives their distance in miles from Denver after x hours. *(Lesson 4-2)*
   a. Graph this function and find the intercepts.
   b. What does each intercept represent?

3. **History** The table shows the number of nations in the United Nations in different years. Find the rate of change for each time interval. During which time interval did the U.N. grow at the greatest rate? *(Lesson 4-3)*

Year	1945	1950	1960	1975
Number of Nations	51	60	99	144

4. The graph shows the temperature of an oven at different times. Find the slope of the line. Then tell what the slope represents. *(Lesson 4-4)*



5. **Sports** Competitive race-walkers move at a speed of about 9 miles per hour. Write a direct variation equation for the distance y that a race-walker will cover in x hours. Then graph. *(Lesson 4-5)*

6. A bicycle rental costs $10 plus $1.50 per hour. *(Lesson 4-6)*
   a. Write an equation that represents the cost as a function of the number of hours. $y = 1.5x + 10$
   b. Identify the slope and y-intercept and describe their meaning.
   c. Find the cost of renting a bike for 6 hours. $19

7. A hot-air balloon is moving at a constant rate. Its altitude is a linear function of time, as shown in the table. Write an equation in slope-intercept form that represents this function. Then find the balloon's altitude after 25 minutes. *(Lesson 4-7)*

Balloon's Altitude	
Time (min)	Altitude (m)
0	250
7	215
12	190

$y = -5x + 250$; 125 m

8. The table shows weights and fuel efficiencies of five cars. *(Lesson 4-8)*

Weight (thousands of pounds)	Fuel efficiency (mi/gal)
3.5	18
2.8	22
2.1	24
4.1	17
2.2	36

   a. Find an equation for a line of best. How well does the line fit the data? $y \approx -6.7x + 43$; moderately well ($r \approx -0.78$)
   b. Predict the fuel efficiency of a car that weighs 3000 pounds. about 23 miles per gallon

9. **Geometry** Show that the points $A(2, 3)$, $B(3, 1)$, $C(-1, -1)$, and $D(-2, 1)$ are the vertices of a rectangle. *(Lesson 4-9)*

10. A phone plan for international calls costs $12.50 per month plus $0.04 per minute. The monthly cost for x minutes of calls is given by the function $f(x) = 0.04x + 12.50$. How will the graph change if the phone company raises the monthly fee to $14.50? if the cost per minute is raised to $0.05? *(Lesson 4-10)*

Extra Practice

Extra Practice Chapter 5 ■ Skills Practice

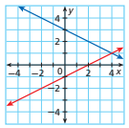
Lesson 5-1

Tell whether the ordered pair is a solution of the given system.

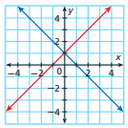
1. $(1, 3)$; $\begin{cases} 2x - 3y = -7 \\ -5x + 3y = 4 \end{cases}$ yes
2. $(-2, 2)$; $\begin{cases} 4x + 3y = -2 \\ -2x - 2y = 2 \end{cases}$ no
3. $(4, -3)$; $\begin{cases} -2x - 3y = 1 \\ x + 2y = -2 \end{cases}$ yes

Use the given graph to find the solution of each system.

4. $\begin{cases} y = \frac{1}{2}x - 1 \\ y = -\frac{1}{2}x + 3 \end{cases}$ (4, 1)



5. $\begin{cases} y = x + 1 \\ y = -x + 1 \end{cases}$ (0, 1)



Solve each system by graphing. Check your answer.

6. $\begin{cases} y = x + 1 \\ y = -2x - 2 \end{cases}$ (−1, 0)
7. $\begin{cases} 3x + y = -8 \\ 3y = \frac{1}{2}x - 5 \end{cases}$ (−2, −2)
8. $\begin{cases} x = 2 - 2y \\ -1 = -2x - 3y \end{cases}$ (−4, 3)

Lesson 5-2

Solve each system by substitution.

9. $\begin{cases} y = 12 - 3x \\ y = 2x - 3 \end{cases}$ (3, 3)
10. $\begin{cases} 2x + y = -6 \\ -5x + y = 1 \end{cases}$ (−1, −4)
11. $\begin{cases} y = 11 - 3x \\ -2x + y = 1 \end{cases}$ (2, 5)
12. $\begin{cases} 2x + 3y = 2 \\ -\frac{1}{2}x + 2y = -6 \end{cases}$ (4, −2)
13. $\begin{cases} 3x - 2y = -3 \\ y = 7 - 4x \end{cases}$ (1, 3)
14. $\begin{cases} 4y - 2x = -2 \\ x + 3y = -4 \end{cases}$ (−1, −1)

Two angles whose measures have a sum of 90° are called complementary angles. For Exercises 15–17, x and y represent the measures of complementary angles. Use this information and the equation given in each exercise to find the measure of each angle.

15. $y = 9x - 10$ $x = 10°$; $y = 80°$
16. $y - 4x = 15$ $x = 15°$; $y = 75°$
17. $y = 2x + 15$ $x = 25°$; $y = 65°$

Lesson 5-3

Solve each system by elimination.

18. $\begin{cases} x - 3y = -1 \\ -x + 2y = -2 \end{cases}$ (8, 3)
19. $\begin{cases} -3x - y = 1 \\ 5x + y = -5 \end{cases}$ (−2, 5)
20. $\begin{cases} -x - 3y = -1 \\ 3x + 3y = 9 \end{cases}$ (4, −1)
21. $\begin{cases} 3x - 2y = 2 \\ 3x + y = 8 \end{cases}$ (2, 2)
22. $\begin{cases} 5x - 2y = -15 \\ 2x - 2y = -12 \end{cases}$ (−1, 5)
23. $\begin{cases} -4x - 2y = -4 \\ -4x + 3y = -24 \end{cases}$ (3, −4)
24. $\begin{cases} -3x - 3y = 3 \\ 2x + y = -4 \end{cases}$ (−3, 2)
25. $\begin{cases} 4x - 3y = -1 \\ 2x - 2y = -4 \end{cases}$ (5, 7)
26. $\begin{cases} 3x + 6y = 0 \\ 7x + 4y = 20 \end{cases}$ (4, −2)

Extra Practice Chapter 5 ■ Skills Practice

Lesson 5-4

Solve each system of linear equations.

27. $\begin{cases} y = 2x + 4 \\ -2x + y = 6 \end{cases}$ no sol.
28. $\begin{cases} -y = 3 - 5x \\ y - 5x = 6 \end{cases}$ no sol.
29. $\begin{cases} y + 2 = 3x \\ 3x - y = -1 \end{cases}$ no sol.
30. $\begin{cases} 2y = 6 - 6x \\ 3y + 9x = 9 \end{cases}$ inf. many solutions
31. $\begin{cases} y - 1 = -3x \\ 12x + 4y = 4 \end{cases}$ inf. many solutions
32. $\begin{cases} 4x - 2y = 4 \\ 3y = 6(x - 1) \end{cases}$ inf. many solutions

Classify each system. Give the number of solutions.

33. $\begin{cases} 2y = 2(4x - 3) \\ y - 1 = 4x \end{cases}$ incons.; no sol.
34. $\begin{cases} 3y + 6x = 9 \\ 2(y - 3) = -4x \end{cases}$ cons., dep.; inf. many solutions
35. $\begin{cases} 3x - 13 = 2y \\ -3y = 2x \end{cases}$ cons., ind.; one sol.

Lesson 5-5

Tell whether the ordered pair is a solution of the given inequality.

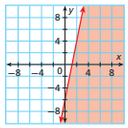
36. $(3, 6)$; $y > 2x + 4$ no
37. $(-2, -8)$; $y \leq 3x - 2$ yes
38. $(-3, 3)$; $y \geq -2x + 5$ no

Graph the solutions of each linear inequality. 39–46. See Additional Answers.

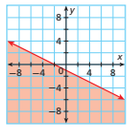
39. $y > 2x$
40. $y \leq -3x + 2$
41. $y \geq 2x - 1$
42. $-y < -x + 4$
43. $y \geq -2x + 4$
44. $y > -x - 3$
45. $y < \frac{1}{2}x + 1\frac{1}{2}$
46. $y \leq 4x - (-1)$

Write an inequality to represent each graph.

47. $y \leq 5x - 6$



48. $y \leq -\frac{1}{2}x - 1$



Lesson 5-6

Tell whether the ordered pair is a solution of the given system.

49. $(2, 5)$; $\begin{cases} y > 3x - 3 \\ y \geq x + 1 \end{cases}$ yes
50. $(3, 9)$; $\begin{cases} y > -3x - 2 \\ y < 2x + 3 \end{cases}$ no
51. $(2, 3)$; $\begin{cases} y > 2x \\ y \leq x - 3 \end{cases}$ no

Graph each system of linear inequalities. Give two ordered pairs that are solutions and two that are not solutions.

52. $\begin{cases} x + 4y < 2 \\ 2y > 3x + 8 \end{cases}$
53. $\begin{cases} y \leq 6 - 2x \\ x - 2y < -2 \end{cases}$
54. $\begin{cases} 2x - 2 > -3y \\ -x + 3y \geq -10 \end{cases}$

Graph each system of linear inequalities. Describe the solutions.

55. $\begin{cases} y > 2x + 1 \\ y < 2x - 2 \end{cases}$
56. $\begin{cases} y < 3x - 1 \\ y > 3x - 4 \end{cases}$
57. $\begin{cases} y \geq -x + 2 \\ y \geq -x + 5 \end{cases}$
58. $\begin{cases} y \geq 2x - 3 \\ y \geq 2x + 3 \end{cases}$
59. $\begin{cases} y > -4x - 2 \\ y \leq -4x - 5 \end{cases}$
60. $\begin{cases} y \geq -2x + 1 \\ y < -2x + 6 \end{cases}$

52–60. See Additional Answers.

Extra Practice Chapter 5 ■ Applications Practice

4, 9–14. See Additional Answers.

1. Net Sounds, an online music store, charges $12 per CD plus $3 for shipping and handling. Web Discs charges $10 per CD plus $9 for shipping and handling. For how many CDs will the cost be the same? What will that cost be? *(Lesson 5-1)* 3; $39

2. At Rocco's Restaurant, a large pizza costs $12 plus $1.25 for each additional topping. At Pizza Palace, a large pizza costs $15 plus $0.75 for each additional topping. For how many toppings will the cost be the same? What will that cost be? *(Lesson 5-1)* 6; $19.50

Use the following information for Exercises 3 and 4.

The coach of a baseball team is deciding between two companies that manufacture team jerseys. One company charges a $60 setup fee and $25 per jersey. The other company charges a $200 setup fee and $15 per jersey. *(Lesson 5-2)*

3. For how many jerseys will the cost at the two companies be the same? What will that cost be? 14; $410
4. The coach is planning to purchase 20 jerseys. Which company is the better option? Why?

5. **Geometry** The length of a rectangle is 5 inches greater than the width. The sum of the length and width is 41 inches. Find the length and width of the rectangle. *(Lesson 5-2)* 23 in.; 18 in.
6. At a movie theater, tickets cost $9.50 for adults and $6.50 for children. A group of 7 moviegoers pays a total of $54.50. How many adults and how many children are in the group? *(Lesson 5-3)* 3 adults, 4 children

7. **Business** A grocer is buying large quantities of fruit to resell at his store. He purchases apples at $0.50 per pound and pears at $0.75 per pound. The grocer spends a total of $17.25 for 27 pounds of fruit. How many pounds of each fruit does he buy? *(Lesson 5-3)* 12 lb of apples; 15 lb of pears
8. Bricks are available in two sizes. Large bricks weigh 9 pounds, and small bricks weigh 4.5 pounds. A bricklayer has 14 bricks that weigh a total of 90 pounds. How many of each type of brick are there? *(Lesson 5-3)* 6 large, 8 small

9. **Sports** The table shows the time it took two runners to complete the Boston Marathon in several different years. If the patterns continue, will Shanna ever complete the marathon in the same number of minutes as Maria? Explain. *(Lesson 5-4)*

Marathon Times (min)				
	2003	2004	2005	2006
Shanna	190	182	174	166
Maria	175	167	159	151

10. Jordan leaves his house and rides his bike at 10 mi/h. After he goes 4 miles, his brother Tim leaves the house and rides in the same direction at 12 mi/h. If their rates stay the same, will Tim ever catch up to Jordan? Explain. *(Lesson 5-4)*

11. Charmaine is buying almonds and cashews for a reception. She wants to spend no more than $18. Almonds cost $4 per pound, and cashews cost $5 per pound. Write a linear inequality to describe the situation. Graph the solutions. Then give two combinations of nuts that Charmaine could buy. *(Lesson 5-5)*

12. Luis is buying T-shirts to give out at a school fund-raiser. He must spend less than $100 for the shirts. Child shirts cost $5 each, and adult shirts cost $8 each. Write a linear inequality to describe the situation. Graph the solutions. Then give two combinations of shirts that Luis could buy. *(Lesson 5-5)*

13. Nicholas is buying treats for his dog. Beef cubes cost $3 per pound, and liver cubes cost $2 per pound. He wants to buy at least 2 pounds of each type of treat, and he wants to spend no more than $14. Graph all possible combinations of the treats that Nicholas could buy. List two possible combinations. *(Lesson 5-6)*

14. **Geometry** The perimeter of a rectangle is at most 20 inches. The length and the width are each at least 3 inches. Graph all possible combinations of lengths and widths that result in such a rectangle. List two possible combinations. *(Lesson 5-6)*

Extra Practice

Extra Practice Chapter 6 ■ Skills Practice

Lesson 6-1 Simplify.

1. 3^{-4} $\frac{1}{81}$
2. 5^{-3} $\frac{1}{125}$
3. -4^{0} -1
4. -2^{-5} $-\frac{1}{32}$
5. 6^{-3} $\frac{1}{216}$
6. $(-2)^{-4}$ $\frac{1}{16}$
7. 1^{-7} 1
8. $(-4)^{-3}$ $-\frac{1}{64}$
9. $(-5)^{0}$ 1
10. $(-1)^{-5}$ -1

Evaluate each expression for the given value(s) of the variable(s).

11. x^{-4} for $x = 2$ $\frac{1}{16}$
12. $(c+3)^{-3}$ for $c = -6$ $-\frac{1}{27}$
13. $3j^{-7}k^{-1}$ for $j = -2$ and $k = 3$ $-\frac{1}{128}$
14. $(2n-2)^{-4}$ for $n = 3$ $\frac{1}{256}$

Simplify.

15. b^4g^{-5} $\frac{b^4}{g^5}$
16. $\frac{k^{-3}}{r^5}$ $\frac{1}{k^3r^5}$
17. $5s^{-3}c^{0}$ $\frac{5}{s^3}$
18. $\frac{z^{-4}}{5t^{-2}}$ $\frac{t^2}{5z^4}$
19. $\frac{f^2}{3a^{-4}}$ $\frac{f^2a^4}{3}$
20. $\frac{-3t^4}{q^{-5}}$ $-3t^4q^5$
21. $\frac{a^0k^{-4}}{p^2}$ $\frac{1}{k^4p^2}$
22. $3f^{-1}y^{-5}$ $\frac{3}{fy^5}$

Lesson 6-2 Simplify each expression.

23. $27^{\frac{1}{3}}$ 3
24. $256^{\frac{1}{4}}$ 4
25. $169^{\frac{1}{2}}$ 13
26. $0^{\frac{1}{5}}$ 0
27. $4^{\frac{3}{2}}$ 8
28. $49^{\frac{3}{2}}$ 343
29. $36^{\frac{3}{2}}$ 216
30. $16^{\frac{5}{4}}$ 32

Simplify. All variables represent nonnegative numbers.

31. $\sqrt{x^2y^6}$ xy^3
32. $\sqrt[3]{a^9b^{15}}$ a^3b^5
33. $\frac{(m^8)^{\frac{1}{2}}}{\sqrt{m^4}}$ m^2
34. $\left(\sqrt[5]{g^{60}}\right)^{\frac{1}{3}}\sqrt[7]{t^{14}}$ g^4t^2

Lesson 6-3 Find the degree of each monomial.

35. 4^7 0
36. x^3y 4
37. $\frac{r^6st^2}{2}$ 9
38. 9^0 0

Find the degree of each polynomial.

39. $a^2b + b - 2^2$ 3
40. $5x^4y^2 - y^5z^2$ 7
41. $3g^4h + h^2 + 4j^6$ 6
42. $4nm^7 - m^6p^3 + p$ 9

Write each polynomial in standard form. Then give the leading coefficient.

43. $4r - 5r^3 + 2r^2$ $-5r^3 + 2r^2 + 4r;\ -5$
44. $-3b^2 + 7b^6 + 4 - b$ $7b^6 - 3b^2 - b + 4;\ 7$
45. $\frac{1}{2}t^3 + t - \frac{1}{3}t^5 + 4$

Classify each polynomial according to its degree and number of terms.

46. $3x^2 + 4x - 5$ quad. trinomial
47. $-4x^2 + x^6 - 4 + x^3$ 6th-deg. polynomial
48. $x^3 - 7^2$ cubic binomial

Lesson 6-4 Add or subtract.

49. $4y^3 - 2y + 3y^3$ $7y^3 - 2y$
50. $9k^2 + 5 - 10k^2 - 6$ $-k^2 - 1$
51. $7 - 3n^2 + 4 + 2n^2$ $-n^2 + 11$
52. $(9x^6 - 5x^2 + 3) + (6x^2 - 5)$ $9x^6 + x^2 - 2$
53. $(2y^5 - 5y^2) + (3y^5 - y^3 + 2y^2)$ $5y^5 - y^3 - 3y^2$
54. $(r^3 + 2r + 1) - (2r^3 - 4)$ $-r^3 + 2r + 5$
55. $(10s^2 + 5) - (5s^2 + 3s - 2)$ $5s^2 - 3s + 7$
56. $(2s^7 - 6s^3 + 2) - (3s^7 + 2)$ $-s^7 - 6s^3$

Extra Practice Chapter 6 ■ Skills Practice 57–71. See Additional Answers.

Lesson 6-5 Multiply.

57. $(3a^2)(2a^4)$
58. $(-3xy^3)(2x^2z)(yz^4)$
59. $(4kt^3m)(-2k^2m^2)$
60. $3jk^2(2j^2 + k)$
61. $4q^3r^2(2qr^2 + 3q)$
62. $3xy^2(2x^2y - 3y)$
63. $(x-3)(x+1)$
64. $(x-2)(x-3)$
65. $(x^2 + 2xy)(3x^2y - 2)$
66. $(x^2 - 3x)(2xy - 3y)$
67. $(x-2)(x^2 + 3x - 4)$
68. $(2x-1)(-2x^2 - 3x + 4)$
69. $(x+3)(2x^4 - 3x^2 - 5)$
70. $(3a+b)(2a^2 + ab - 2b^2)$
71. $(a^2 - b)(3a^2 - 2ab + 3b^2)$

Lesson 6-6 Multiply.

72. $(x+3)^2$ $x^2 + 6x + 9$
73. $(3+2x)^2$ $4x^2 + 12x + 9$
74. $(4x+2y)^2$ $16x^2 + 16xy + 4y^2$
75. $(3x-2)^2$ $9x^2 - 12x + 4$
76. $(5-2x)^2$ $4x^2 - 20x + 25$
77. $(3x-5y)^2$ $9x^2 - 30xy + 25y^2$
78. $(3+x)(3-x)$ $9 - x^2$
79. $(x-5)(x+5)$ $x^2 - 25$
80. $(2x+1)(2x-1)$ $4x^2 - 1$
81. $(x^2+4)(x^2-4)$ $x^4 - 16$
82. $(2+3x^3)(2-3x^3)$ $4 - 9x^6$
83. $(4x^3 - 3y)(4x^3 + 3y)$ $16x^6 - 9y^2$

Extra Practice Chapter 6 ■ Applications Practice

1. The eye of a bee is about 10^{-3} m in diameter. Simplify this expression. *(Lesson 6-1)* 0.001 m

2. A typical stroboscopic camera has a shutter speed of 10^{-6} seconds. Simplify this expression. *(Lesson 6-1)* 0.000001 s

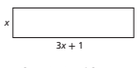
3. Carl has 4 identical cubes lined up in a row and wants to find the total length of the cubes. He knows that the volume of one cube is 343 in^3. Use the formula $s = V^{\frac{1}{3}}$ to find the length of one cube. What is the length of the row of cubes? *(Lesson 6-2)* 28 in.

4. A rock is thrown off a 220-foot cliff with an initial velocity of 50 feet per second. The height of the rock above the ground is given by the polynomial $-16t^2 - 50t + 220$, where t is the time in seconds after the rock has been thrown. What is the height of the rock above the ground after 2 seconds? *(Lesson 6-3)* 56 ft

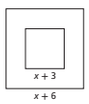
5. The sum of the first n natural numbers is given by the polynomial $\frac{1}{2}n^2 + \frac{1}{2}n$. Use this polynomial to find the sum of the first 9 natural numbers. *(Lesson 6-3)* 45

6. **Biology** The population of insects in a meadow depends on the temperature. A biologist models the population of insect A with the polynomial $0.02x^2 + 0.5x + 8$ and the population of insect B with the polynomial $0.04x^2 - 0.2x + 12$, where x represents the temperature in degrees Fahrenheit. *(Lesson 6-4)* $0.06x^2 + 0.3x + 20$
   a. Write a polynomial that represents the total population of both insects.
   b. Write a polynomial that represents the difference of the populations of insect B and insect A. $0.02x^2 - 0.7x + 4$

7. **Geometry** The length of the rectangle shown is 1 inch longer than 3 times the width.
   a. Write a polynomial that represents the area of the rectangle. $3x^2 + x$
   b. Find the area of the rectangle when the width is 4 inches. *(Lesson 6-5)* 52 in^2



8. A cabinet maker starts with a square piece of wood and then cuts a square hole from its center as shown. Write a polynomial that represents the area of the remaining piece of wood. *(Lesson 6-6)* $6x + 27$



Extra Practice

Extra Practice Chapter 7 ■ Skills Practice

Lesson 7-1

Write the prime factorization of each number.

1. 24 $2^3 \cdot 3$
2. 78 $2 \cdot 3 \cdot 13$
3. 88 $2^3 \cdot 11$
4. 63 $3^2 \cdot 7$
5. 128 2^7
6. 102 $2 \cdot 3 \cdot 17$
7. 71 prime
8. 125 5^3

Find the GCF of each pair of numbers.

9. 18 and 66 6
10. 24 and 104 8
11. 30 and 75 15
12. 24 and 120 24
13. 36 and 99 9
14. 42 and 72 6

Find the GCF of each pair of monomials.

15. $4a^3$ and $9a^4$ a^3
16. $6q^2$ and $15q^5$ $3q^2$
17. $6x^2$ and $14y^3$ 2
18. $4z^2$ and $10z^5$ $2z^2$
19. $5g^3$ and $9g$ g
20. $12x^2$ and $21y^2$ 3

Lesson 7-2

Factor each polynomial. Check your answer.

21. $6b^2 - 15b^3$ $3b^2(2 - 5b)$
22. $11t^4 - 9t^3$ $t^3(11t - 9)$
23. $10v^3 - 25v$ $5v(2v^2 - 5)$
24. $12r + 16r^3$ $4r(3 + 4r^2)$
25. $17a^4 - 35a^2$ $a^2(17a^2 - 35)$
26. $9f + 18f^5 + 12f^2$ $3f(3 + 6f^4 + 4f)$

Factor each expression. **27–54. See Additional Answers.**

27. $3(a + 3) + 4a(a + 3)$
28. $5(k - 4) - 2k(k - 4)$
29. $5(c - 3) + 4c^2(c - 3)$
30. $3(t - 4) + t(t - 4)$
31. $5(2r - 1) - s(2r - 1)$
32. $7(3d + 4) - 2e(3d + 4)$

Factor each polynomial by grouping. Check your answer.

33. $x^3 + 3x^2 - 2x - 6$
34. $2m^3 - 3m^2 + 8m - 12$
35. $3k^3 - k^2 + 15k - 5$
36. $15r^3 + 25r^2 - 6r - 10$
37. $12n^3 - 6n^2 - 10n + 5$
38. $4z^3 - 3z^2 + 4z - 3$
39. $2k^2 - 3k + 12 - 8k$
40. $3p^2 - 2p + 8 - 12p$
41. $10d^2 - 6d + 9 - 15d$
42. $6a^3 - 4a^2 + 10 - 15a$
43. $12s^3 - 2s^2 + 3 - 18s$
44. $4c^3 - 3c^2 + 15 - 20c$

Lesson 7-3

Factor each trinomial. Check your answer.

45. $x^2 + 15x + 36$
46. $x^2 + 13x + 40$
47. $x^2 + 10x + 16$
48. $x^2 - 9x + 18$
49. $x^2 - 11x + 28$
50. $x^2 - 13x + 42$
51. $x^2 + 4x - 21$
52. $x^2 - 5x - 36$
53. $x^2 - 7x - 30$
54. Factor $c^2 - 2c - 48$. Show that the original polynomial and the factored form describe the same sequence of values for $c = 0, 1, 2, 3$, and 4.

Copy and complete the table.

	$x^2 + bx + c$	Sign of c	Binomial factors	Sign of Numbers in Binomials
	$x^2 + 9x + 20$	Positive	$(x + 4)(x + 5)$	Both positive
55.	$x^2 - x - 20$	Negative	$(x + 4)(x - 5)$	Positive, negative
56.	$x^2 - 2x - 8$	Negative	$(x + 2)(x - 4)$	Positive, negative
57.	$x^2 - 6x + 8$	Positive	$(x - 2)(x - 4)$	Both negative

Extra Practice Chapter 7 ■ Skills Practice

58–96, 112–129. See Additional Answers.

Lesson 7-4

Factor each trinomial. Check your answer.

58. $2x^2 + 13x + 15$
59. $3x^2 + 14x + 16$
60. $8x^2 - 16x + 6$
61. $6x^2 + 11x + 4$
62. $3x^2 - 11x + 6$
63. $10x^2 - 31x + 15$
64. $6x^2 - 5x - 4$
65. $8x^2 - 14x - 15$
66. $4x^2 - 11x + 6$
67. $12x^2 - 13x + 3$
68. $6x^2 - 7x - 10$
69. $6x^2 + 7x - 3$
70. $2x^2 + 5x - 12$
71. $6x^2 - 5x - 6$
72. $8x^2 + 10x - 3$
73. $10x^2 - 11x - 6$
74. $4x^2 - x - 5$
75. $6x^2 - 7x - 20$
76. $-2x^2 + 11x - 5$
77. $-6x^2 - x + 12$
78. $-8x^2 - 10x - 3$
79. $-4x^2 + 16x - 15$
80. $-10x^2 + 21x + 10$
81. $-3x^2 + 13x - 14$

Lesson 7-5

Determine whether each trinomial is a perfect square. If so, factor. If not, explain why.

82. $x^2 - 8x + 16$
83. $4x^2 - 4x + 1$
84. $x^2 - 8x + 9$
85. $9x^2 - 14x + 4$
86. $4x^2 + 12x + 9$
87. $x^2 + 8x - 16$
88. $9x^2 - 42x + 49$
89. $4x^2 + 18x + 25$
90. $16x^2 - 24x + 9$

Determine whether each trinomial is the difference of two squares. If so, factor. If not, explain why.

91. $4 - 16x^4$
92. $-t^2 - 35$
93. $c^2 - 25$
94. $g^5 - 9$
95. $v^4 - 64$
96. $x^2 - 120$
97. $x^2 - 36$ $(x - 6)(x + 6)$
98. $9m^2 - 15$ No; 15 is not a perf. square.
99. $25c^2 - 16$ $(5c - 4)(5c + 4)$

Find the missing term in each perfect-square trinomial.

100. $4x^2 - 20x +$ 25
101. $9x^2 +$ 6x $+ 1$
102. 16x^2 $- 56x + 49$
103. $9b^2 -$ 30$b +$ 25
104. 4$a^2 + 28a + 49$
105. $4a^2 + 4a +$ 1

Lesson 7-6

Tell whether each expression is completely factored. If not, factor.

106. $5(16x^2 + 4)$ no; $20(4x^2 + 1)$
107. $3r(4x - 9)$ yes
108. $(9d - 6)(2d - 7)$ no; $3(3d - 2)(2d - 7)$
109. $(5 - h)(6 - 5h)$ yes
110. $12y^2 - 2y - 24$ no; $2(2y - 3)(3y + 4)$
111. $3f(2f^2 + 5fg + 2g^2)$ no; $3f(2f + g)(f + 2g)$

Factor each polynomial completely. Check your answer.

112. $12b^3 - 48b$
113. $24u^4 - 20u^3 - 16u^2$
114. $18k^3 - 32k$
115. $4a^3 + 12a^2 - a^2b - 3ab$
116. $3x^3y - 6x^2y^2 + 3xy^3$
117. $36p^2q - 64q^3$
118. $32a^4 - 8a^2$
119. $m^3 + 5m^2n + 6mn^2$
120. $4x^2 - 3x^2 - 16x + 48x$
121. $18d^2 + 3d - 6$
122. $2r^2 - 9r - 18$
123. $8y^2 + 4y - 4$
124. $81 - 36u^2$
125. $8x^4 + 12x^2 - 20$
126. $10j^3 + 15j^2 - 70j$
127. $27z^3 - 18z^2 + 3z$
128. $4b^2 + 2b - 72$
129. $3f^2 - 3g^2$

Extra Practice Chapter 7 ■ Applications Practice

1. Ms. Andrews's class has 12 boys and 18 girls. For a class picture, the students will stand in rows on a set of steps. Each row must have the same number of students, and each row will contain only boys or girls. How many rows will there be if Ms. Andrews puts the maximum number of students in each row? *(Lesson 7-1)* 5
2. A museum director is planning an exhibit of Native American baskets. There are 40 baskets from North America and 32 baskets from South America. The baskets will be displayed on shelves so that each shelf has the same number of baskets. Baskets from North and South America will not be placed together on the same shelf. How many shelves will be needed if each shelf holds the maximum number of baskets? *(Lesson 7-1)* 9
3. The area of a rectangular painting is $(3x^2 + 5x)$ ft^2. Factor this polynomial to find possible expressions for the dimensions of the painting. *(Lesson 7-2)* x ft, $(3x + 5)$ ft
4. **Geometry** The surface area of a cylinder with radius r and height h is given by the expression $2\pi r^2 + 2\pi rh$. Factor this expression. *(Lesson 7-2)* $2\pi r(r + h)$
5. The area of a rectangular classroom in square feet is given by $x^2 + 9x + 18$. The width of the classroom is $(x + 3)$ ft. What is the length of the classroom? *(Lesson 7-3)* $(x + 6)$ ft

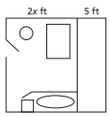
Gardening **Use the following information for Exercises 6 and 7.**

A rectangular flower bed has a width of $(x + 4)$ ft. The bed will be enlarged by increasing the length, as shown. *(Lesson 7-3)*

6. The original flower bed has an area of $(x^2 + 9x + 20)$ ft^2. What is its length? $(x + 5)$ ft
7. The enlarged flower bed will have an area of $(x^2 + 12x + 32)$ ft^2. What will be the new length of the flower bed? $(x + 8)$ ft
8. A rectangular poster has an area of $(6x^2 + 19x + 15)$ in^2. The width of the poster is $(2x + 3)$ in. What is the length of the poster? *(Lesson 7-4)* $(3x + 5)$ in.
9. **Physics** The height of an object thrown upward with a velocity of 38 feet per second from an initial height of 5 feet can be modeled by the polynomial $-16t^2 + 38t + 5$, where t is the time in seconds. Factor this expression. Then use the factored expression to find the object's height after $\frac{1}{2}$ second. *(Lesson 7-4)* $-1(8t + 1)(2t - 5)$; 20 ft
10. A rectangular pool has an area of $(9x^2 + 30x + 25)$ ft^2. The dimensions of the pool are of the form $ax + b$, where a and b are whole numbers. Find an expression for the perimeter of the pool. Then find the perimeter when $x = 5$. *(Lesson 7-5)* $12x + 20$; 80
11. **Geometry** The area of a square is $9x^2 - 24x + 16$. Find the length of each side of the square. Is it possible for x to equal 1 in this situation? Why or why not? *(Lesson 7-5)* 11. See Additional Answers.

Architecture **Use the following information for Exercises 12–14.**

An architect is designing a rectangular hotel room. A balcony that is 5 feet wide runs along the length of the room, as shown in the figure. *(Lesson 7-6)*



12. The area of the room, including the balcony, is $(4x^2 + 12x + 5)$ ft^2. Tell whether the polynomial is fully factored. Explain. No; it can be factored as $(2x + 5)(2x + 1)$.
13. Find the length and width of the room (including the balcony). $(2x + 5)$ ft; $(2x + 1)$ ft
14. How long is the balcony when $x = 9$? 19 ft

Extra Practice

Extra Practice Chapter 8 ■ Skills Practice 1–3. See Additional Answers.

Lesson 8-1

Tell whether each function is quadratic. Explain.

1. $y + 4x^2 = 2x - 3$
2. $4x - y = 3$
3. $3x^2 - 4 = y + x$

4.

x	−6	−4	−2	0	2
y	−5	−6	−4	2	11

No; the second differences are not constant.

5.

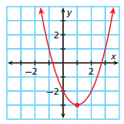
x	0	1	2	3	4
y	−5	−5	−3	1	7

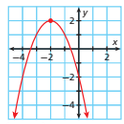
Yes; the second differences are constant.

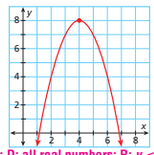
Tell whether the graph of each quadratic function opens upward or downward. Then use a table of values to graph each function. For graphs, see Additional Answers.

6. $y = -3x^2$ downward
7. $y = \frac{2}{3}x^2$ upward
8. $y = x^2 + 2$ upward
9. $y = -4x^2 + 2x$ downward

Identify the vertex of each parabola. Then find the domain and range.

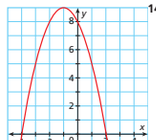
10. 
(1, −3); D: all real numbers; R: $y \geq -3$

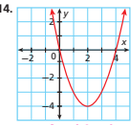
11. 
(−2, 2); D: all real numbers; R: $y \leq 2$

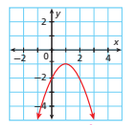
12. 
(4, 8); D: all real numbers; R: $y \leq 8$

Lesson 8-2

Find the zeros of each quadratic function and the axis of symmetry of each parabola from the graph.

13. 
zeros: −4 and 2; axis of symmetry: $x = -1$

14. 
zeros: 0 and 4; axis of symmetry: $x = 2$

15. 
zeros: none; axis of symmetry: $x = 1$

Find the vertex.

16. $y = 3x^2 - 6x + 2$ (1, −1)
17. $y = -2x^2 + 8x - 3$ (2, 5)
18. $y = x^2 + 2x - 4$ (−1, −5)

Lesson 8-3

Graph each quadratic function. 19–24. See Additional Answers.

19. $y = x^2 - 4x + 1$
20. $y = -x^2 - x + 4$
21. $y = 3x^2 - 3x + 1$
22. $y - 2 = 2x^2$
23. $y + 3x^2 = 3x - 1$
24. $y - 4 = x^2 + 2x$

Lesson 8-4

Order the functions from narrowest to widest.

25. $f(x) = 2x^2$, $g(x) = -4x^2$, $h(x) = -x^2$ $f(x)$, $h(x)$, $g(x)$
26. $f(x) = 3x^2$, $g(x) = \frac{1}{2}x^2$, $h(x) = -2x^2$ $g(x)$, $f(x)$, $h(x)$
27. $f(x) = 4x^2$, $g(x) = x^2$, $h(x) = -\frac{1}{4}x^2$ $f(x)$, $g(x)$, $h(x)$
28. $f(x) = 2x^2$, $g(x) = 5x^2$, $h(x) = -3x^2$ $g(x)$, $h(x)$, $f(x)$

Compare the graph of $f(x) = x^2$.

29. $g(x) = 2x^2 - 2$
30. $g(x) = -\frac{1}{2}x^2$
31. $g(x) = -3x^2 + 1$

29–31. See Additional Answers.

Extra Practice Chapter 8 ■ Skills Practice

Lesson 8-5

Solve each quadratic equation by graphing the related function.

32. $x^2 - x - 2 = 0$ −1, 2
33. $x^2 - 2x + 8 = 0$ no real solutions
34. $2x^2 + 4x - 6 = 0$ −3, 1
35. $2x^2 + 9x = -4$ $-\frac{1}{2}$, −4
36. $2x^2 + 3 = 0$ no real solutions
37. $2x^2 - 2x - 12 = 0$ −2, 3
38. $3x^2 = -3x + 6$ −2, 1
39. $x^2 = 4$ −2, 2
40. $2x^2 + 6x - 20 = 0$ −5, 2

Lesson 8-6

Use the Zero Product Property to solve each equation. Check your answer.

41. $(x + 3)(x - 2) = 0$ −3, 2
42. $(x - 4)(x + 2) = 0$ −2, 4
43. $(x)(x - 4) = 0$ 0, 4
44. $(2x + 6)(x - 2) = 0$ −3, 2
45. $(3x - 1)(x + 3) = 0$ −3, $\frac{1}{3}$
46. $(x)(2x - 4) = 0$ 0, 2

Solve each quadratic equation by factoring. Check your answer.

47. $x^2 + 5x + 6 = 0$ −3, −2
48. $x^2 - 3x - 4 = 0$ −1, 4
49. $x^2 + x - 12 = 0$ −4, 3
50. $x^2 + x - 6 = 0$ −3, 2
51. $x^2 - 6x + 5 = 0$ 1, 5
52. $x^2 + 4x - 12 = 0$ −6, 2

Lesson 8-7

Solve using square roots. Check your answer.

53. $x^2 = 169$ ±13
54. $x^2 = 121$ ±11
55. $x^2 = 289$ ±17
56. $x^2 = -64$ no real solutions
57. $x^2 = 81$ ±9
58. $x^2 = -441$ no real solutions
59. $4x^2 - 196 = 0$ ±7
60. $0 = 3x^2 - 48$ ±4
61. $24x^2 + 96 = 0$ no real solutions

Solve. Round to the nearest hundredth.

62. $4x^2 = 160$ ±6.32
63. $0 = 3x^2 - 66$ ±4.69
64. $250 - 5x^2 = 0$ ±7.07
65. $0 = 9x^2 - 72$ ±2.83
66. $48 - 2x^2 = 42$ ±1.73
67. $6x^2 = 78$ ±3.61

Lesson 8-8

Complete the square to form a perfect-square trinomial.

68. $x^2 - 8x +$ 16
69. $x^2 + x +$ $\frac{1}{4}$
70. $x^2 + 10x +$ 25
71. $x^2 - 5x +$ $\frac{25}{4}$
72. $x^2 + 6x +$ 9
73. $x^2 - 7x +$ $\frac{49}{4}$

Solve by completing the square.

74. $x^2 + 6x = 91$ −13, 7
75. $x^2 + 10x = -16$ −8, −2
76. $x^2 - 4x = 12$ −2, 6
77. $x^2 - 8x = -12$ 2, 6
78. $x^2 - 12x = -35$ 5, 7
79. $-x^2 - 6x = 5$ −5, −1
80. $-x^2 - 4x + 77 = 0$ −11, 7
81. $-x^2 = 10x + 9$ −9, −1
82. $-x^2 + 63 = -2x$ −7, 9

Lesson 8-9

Solve using the quadratic formula. 86–88. See Additional Answers.

83. $x^2 + 3x - 4 = 0$ −4, 1
84. $x^2 - 2x - 8 = 0$ −2, 4
85. $x^2 + 2x - 3 = 0$ −3, 1
86. $x^2 - x - 10 = 0$
87. $2x^2 - x - 4 = 0$
88. $2x^2 + 3x - 3 = 0$

Find the number of real solutions of each equation using the discriminant.

89. $x^2 + 4x + 1 = 0$ 2
90. $2x^2 - 3x + 2 = 0$ 0
91. $x^2 - 5x + 2 = 0$ 2
92. $2x^2 - 4x + 2 = 0$ 1
93. $x^2 + 2x - 5 = 0$ 2
94. $2x^2 - 2x - 3 = 0$ 2

Lesson 8-10

Solve each system of equations.

95. $\begin{cases} y = -x - 1 \\ y = x^2 - 3 \end{cases}$ (3, 2)
96. $\begin{cases} y = -3x \\ y = x^2 + 2 \end{cases}$ (−1, 3)
97. $\begin{cases} y = 3x - 2 \\ y = -3x^2 + 4 \end{cases}$ (−2, −8)
98. $\begin{cases} y = -x + 6 \\ y = x^2 - x + 2 \end{cases}$ (2, 4)
99. $\begin{cases} y = x - 1 \\ y = x^2 - 5x + 3 \end{cases}$ (−2, 1)
100. $\begin{cases} y = 2x - 7 \\ y = x^2 - 2x - 4 \end{cases}$ (3, −1)

Extra Practice Chapter 8 ■ Applications Practice

1. The table shows the height of a ball at various times after being thrown into the air. Tell whether the function is quadratic. Explain. *(Lesson 8-1)* Yes; the second differences are constant.

Time (s)	0	0.5	1	1.5	2
Height (ft)	4	20	28	28	20

2. The height of the curved roof of a camping tent can be modeled by $f(x) = -0.5x^2 + 3x$, where x is the width in feet. Find the height of the tent at its tallest point. *(Lesson 8-2)* 4.5 ft

3. **Engineering** A small bridge passes over a stream. The height in feet of the bridge's curved arch support can be modeled by $f(x) = -0.25x^2 + 2x + 1.5$, where the x-axis represents the level of the water. Find the greatest height of the arch support. *(Lesson 8-2)* 5.5 ft

4. **Sports** The height in meters of a football that is kicked from the ground is approximated by $f(x) = -5x^2 + 20x$, where x is the time in seconds after the ball is kicked. Find the ball's maximum height and the time it takes the ball to reach this height. Then find how long the ball is in the air. *(Lesson 8-3)* 20 m; 2 s; 4 s

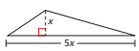
5. **Physics** Two golf balls are dropped, one from a height of 400 feet and the other from a height of 576 feet. *(Lesson 8-4)* 5. See Additional Answers.
   a. Compare the graphs that show the time it takes each golf ball to reach the ground.
   b. Use the graphs to tell when each golf ball reaches the ground.

6. A model rocket is launched into the air with an initial velocity of 144 feet per second. The quadratic function $y = -16x^2 + 144x$ models the height of the rocket after x seconds. How long is the rocket in the air? *(Lesson 8-5)* 9 s

7. A gymnast jumps on a trampoline. The quadratic function $y = -16x^2 + 24x$ models her height in feet above the trampoline after x seconds. How long is the gymnast in the air? *(Lesson 8-5)* 1.5 s

8. A child standing on a rock tosses a ball into the air. The height of the ball above the ground is modeled by $h = -16t^2 + 28t + 8$, where h is the height in feet and t is the time in seconds. Find the time it takes the ball to reach the ground. *(Lesson 8-6)* 2 s

9. **Geometry** The base of the triangle in the figure is five times the height. The area of the triangle is 400 in^2. Find the height of the triangle to the nearest tenth. *(Lesson 8-7)* 12.6 in.



10. The length of a rectangular swimming pool is 8 feet greater than the width. The pool has an area of 240 ft^2. Find the length and width of the pool. *(Lesson 8-8)* 20 ft; 12 ft

11. **Geometry** One base of a trapezoid is 4 ft longer than the other base. The height of the trapezoid is equal to the shorter base. The trapezoid's area is 80 ft^2. Find the height. $\left(\text{Hint: } A = \frac{1}{2}h(b_1 + b_2)\right)$ *(Lesson 8-8)* 8 ft

12. A referee tosses a coin into the air at the start of a football game to decide which team will get the ball. The height of the coin above the ground is modeled by $h = -16t^2 + 12t + 4$, where h is the height in feet and t is the time in seconds after the coin is tossed. Will the coin reach a height of 8 feet? Use the discriminant to explain your answer. *(Lesson 8-9)* 12. See Additional Answers.

13. The population in thousands of Millville can be modeled by the equation $P(t) = t^2 + 2t$. The population in thousands of Barton can be modeled by the equation $y = 8t + 15$. In both cases, t is the number of years since 2010. In what year will the populations of the two towns be approximately equal? *(Lesson 8-10)* 2018

Extra Practice

Extra Practice Chapter 9 ■ Skills Practice 1, 2. See Additional Answers.

Lesson 9-1

Find the next three terms in each geometric sequence. −162, 486, −1,458

1. 1, 5, 25, 125 …
2. 736, 368, 184, 92, …
3. −2, 6, −18, 54, …
4. 8, 2, $\frac{1}{2}$, $\frac{1}{8}$, … $\frac{1}{32}$, $\frac{1}{128}$, $\frac{1}{512}$
5. 7, −14, 28, −56, … 112, −224, 448
6. $\frac{1}{9}$, $\frac{1}{3}$, 1, 3, … 9, 27, 81
7. The first term of a geometric sequence is 2, and the common ratio is 3. What is the 8th term of the sequence? 4,374
8. What is the 8th term of the geometric sequence 600, 300, 150, 75, …? 4.6875

Lesson 9-2

Tell whether each set of ordered pairs satisfies an exponential function. Explain your answer. 9–18. See Additional Answers.

9. $\left\{\left(-1, \frac{1}{2}\right), (0, 2), (1, 8), (2, 32)\right\}$
10. $\left\{\left(-1, -\frac{1}{2}\right), (0, 0), \left(1, \frac{1}{2}\right), (2, 4)\right\}$
11. $\left\{(-1, 4), (0, 1), \left(1, \frac{1}{4}\right), \left(2, \frac{1}{16}\right)\right\}$
12. $\{(0, 0), (1, 3), (2, 12), (3, 27)\}$

Graph each exponential function.

13. $y = 3(2)^x$
14. $y = \frac{1}{2}(4)^x$
15. $y = -3^x$
16. $y = -\frac{1}{2}(2)^x$
17. $y = 5\left(\frac{1}{2}\right)^x$
18. $y = -2(0.25)^x$

Lesson 9-3

Write an exponential growth function to model each situation. Then find the value of the function after the given amount of time.

19. The rent for an apartment is $6600 per year and increasing at a rate of 4% per year; 5 years. $y = 6600(1.04)^t$; $8029.91
20. A museum has 1200 members and the number of members is increasing at a rate of 2% per year; 8 years. $y = 1200(1.02)^t$; 1406

Write a compound interest function to model each situation. Then find the balance after the given number of years.

21. $4000 invested at a rate of 4% compounded quarterly; 3 years $A = 4000(1.01)^{4t}$; $4507.30
22. $5200 invested at a rate of 2.5% compounded annually; 6 years $A = 5200(1.025)^t$; $6030.41

Write an exponential decay function to model each situation. Then find the value of the function after the given amount of time. $y = 800(0.94)^t$; $587.12

23. The cost of a stereo system is $800 and is decreasing at a rate of 6% per year; 5 years.
24. The population of a town is 14,000 and is decreasing at a rate of 2% per year; 10 years. $y = 14{,}000(0.98)^t$; 11,439

Extra Practice Chapter 9 ■ Skills Practice

Lesson 9-4

Graph each data set. Which kind of model best describes the data?

25. $\{(0, 3), (1, 0), (2, -1), (3, 0), (4, 3)\}$ quadratic 25–27. For graphs, see Additional Answers.
26. $\{(-4, -4), (-3, -3.5), (-2, -3), (-1, -2.5), (0, -2), (1, -1.5)\}$ linear
27. $\{(0, 4), (1, 2), (2, 1), (3, 0.5), (4, 0.25)\}$ exponential

Look for a pattern in each data set to determine which kind of model best describes the data.

28. $\{(-1, -5), (0, -5), (1, -3), (2, 1), (3, 7)\}$ quadratic
29. $\{(0, 0.25), (1, 0.5), (2, 1), (3, 2), (4, 4)\}$ exponential
30. $\{(-2, 11), (-1, 8), (0, 5), (1, 2), (2, -1)\}$ linear

Lesson 9-5

31. Identify the type of functions shown. Compare the functions by finding and interpreting slopes and y-intercepts. 31. Linear; Function A: slope is 3, y-intercept is 2; Function B: slope is 3, y-intercept is −4; the graphs of the functions are parallel and Function B is always below Function A.

Function A

x	0	1	2	3	4
y	2	5	8	11	14

Function B

$y = 3x - 4$

32. Identify the type of functions shown. Compare the functions by finding and interpreting maximums, minimums, x-intercepts, and average rates of change over the x-interval [0, 10]. 32. Quadratic; Function A: min(−3, −7.5), x-intercepts at (0, −6.9) and (0, 0.9), 8; Function B: max(3, 1.5), x-intercepts at (0, 1.3) and (0, 4.7), −2

Function A

$y = 0.5x^2 + 3x - 3$

Function B

x	0	2	4	6	8	10
y	−3	1	1	−3	−11	−23

33. Identify the type of functions shown. Compare the functions by finding the average rates of change over the interval [0, 4]. 33. Exponential; Function A: 3.05; Function B: −0.703

Function A

x	0	1	2	3	4
y	3	4.5	6.8	10.1	15.2

Function B

$y = 3(0.5)^x$

Extra Practice Chapter 9 ■ Applications Practice

5. See Additional Answers.

1. Scientists who are developing a vaccine track the number of new infections of a disease each year. The values in the table form a geometric sequence. To the nearest whole number, how many new infections will there be in the 6th year? *(Lesson 9-1)* 2848

Year	Number of New Infections
1	12,000
2	9000
3	6750

2. **Finance** For a savings account that earns 5% interest each year, the function $f(x) = 2000(1.05)^x$ gives the value of a $2000 investment after x years. *(Lesson 9-2)*
   a. Find the investment's value after 5 years. $2552.56
   b. Approximately how many years will it take for the investment to be worth $3100? 9
3. **Chemistry** Cesium-137 has a half-life of 30 years. Find the amount left from a 200-gram sample after 150 years. *(Lesson 9-3)* 6.25 grams
4. The cost of tuition at a dance school is $300 a year and is increasing at a rate of 3% a year. Write an exponential growth function to model the situation and find the cost of tuition after 4 years. *(Lesson 9-3)* $y = 300(1.03)^t$; $337.65
5. Use the data in the table to describe how the price of the company's stock is changing. Then write a function that models the data. Use your function to predict the price of the company's stock after 7 years. *(Lesson 9-4)*

Stock Prices				
Year	0	1	2	3
Price ($)	10.00	11.00	12.20	13.31

6. Use the data in the table to describe the rate at which Susan reads. Then write a function that models the data. Use your function to predict the number of pages Susan will read in 6 hours. *(Lesson 9-4)*

Total Number of Pages Read				
Time (h)	1	2	3	4
Pages	48	96	144	192

Susan reads 48 pages per hour; $y = 48x$; 288

7. **Savings** Mary has $50 in her savings account. She is considering two options for increasing her savings. Option A recommends increasing the amount in her savings by $5 per month. Option B recommends a 5% increase each month. Compare the options. *(Lesson 9-5)*
8. **Critical Thinking** A tutoring center has 100 students. The director wants to set a goal to motivate her instructors to increase student enrollment. Under plan A, the goal is to increase the number of students by 15% each year. Under plan B, the goal is to increase the number of students by 25 each year.
   a. Compare the plans.
   b. Which plan should the director choose to double the enrollment in the shortest amount of time? Explain.
   c. When will the center have about the same number of students enrolled under both plans? Will this happen more than once? Explain. *(Lesson 9-5)*

7. Under Option A, Mary will have more money in savings for about 26 months. After 27 months, she will have more money saved under Option B.

8a. Plan A is an exponential growth function. It will start growing slowly and grow more quickly as time goes on. Plan B is a linear function. It will grow steadily over time.

8b. Plan B will reach double the enrollment in about 4 years. Plan A will take about 5 years to double the enrollment.

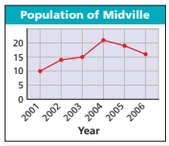
8c. The enrollment is the same sometime during year 7. After that, Plan A will always have more students enrolled.

Extra Practice

Extra Practice Chapter 10 ■ Skills Practice

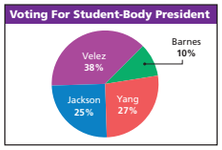
Lesson 10-1

Use the line graph for Exercises 1–4.



1. In what year was the population the greatest? 2004
2. Estimate the population in 2005. 19,000
3. During which one-year period did the population increase by the greatest amount? 2003 to 2004
4. Estimate the amount by which the population decreased from 2005 to 2006. 3,000

Use the circle graph for Exercises 5–7.



5. Which candidate received the fewest votes? Barnes
6. Which two candidates received approximately the same number of votes? Jackson, Yang
7. A total of 400 students voted in the election. How many votes did Velez receive? 152

Lesson 10-2

The daily high temperatures in degrees Celsius during a two-week period in Madison, Wisconsin, are given at right.

High Temperatures (°C)						
22	25	28	33	29	24	19
19	18	25	32	30	32	25

8. Use the data to make a stem-and-leaf plot.
9. Use the data to make a frequency table with intervals.
10. Use the frequency table from Exercise 9 to make a histogram for the data.
11. Use the data to make a cumulative frequency table.

8–11. See Additional Answers.

Lesson 10-3

Find the mean, median, mode, and range of each data set.

12. 42, 45, 48, 45 mean: 45; median: 45; mode: 45; range: 6
13. 66, 68, 68, 62, 61, 68, 65, 60 mean: 64.75; median: 65.5; mode: 68; range: 8

Identify the outlier in each data set, and determine how the outlier affects the mean, median, mode, and range of the data.

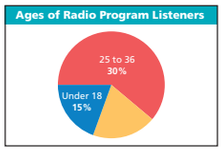
14. 4, 8, 15, 8, 71, 7, 6
15. 36, 7, 50, 40, 38, 48, 40

Use the data to make a box-and-whisker plot.

16. 7, 8, 10, 2, 5, 1, 10, 8, 5, 5
17. 54, 64, 50, 48, 53, 55, 57

Lesson 10-4

18. The graph shows the ages of people who listen to a radio program.
    a. Explain why the graph is misleading.
    b. What might someone believe because of the graph?
    c. Who might want to use this graph? Explain.



19. A researcher surveys people at the Elmwood library about the number of hours they spend reading each day. Explain why the following statement is misleading: "People in Elmwood read for an average of 1.5 hours per day."

14–19. See Additional Answers.

Extra Practice Chapter 10 ■ Skills Practice

Lesson 10-5

20. Identify the sample space and the outcome shown for the spinner at right. Sample space: {blue, green, yellow}; outcome shown: yellow

Write *impossible*, *unlikely*, *as likely as not*, *likely*, or *certain* to describe each event.

21. Two people sitting next to each other on a bus have the same birthday. unlikely
22. Dylan rolls a number greater than 1 on a standard number cube. likely

An experiment consists of randomly choosing a fruit snack from a box. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
Cherry	8
Peach	6
Blueberry	6

23. choosing a blueberry fruit snack $\frac{3}{10}$
24. choosing a cherry fruit snack $\frac{2}{5}$
25. not choosing a cherry fruit snack $\frac{3}{5}$

Lesson 10-6

Find the theoretical probability of each outcome.

26. rolling an even number on a number cube $\frac{1}{2}$
27. tossing two coins and both landing tails up $\frac{1}{4}$
28. randomly choosing a prime number from a bag that contains ten slips of paper numbered 1 through 10 $\frac{2}{5}$
29. The probability of choosing a green marble from a bag is $\frac{3}{7}$. What is the probability of not choosing a green marble? $\frac{4}{7}$
30. The odds against winning a game are 8:3. What is the probability of winning the game? $\frac{3}{11}$

Lesson 10-7

Tell whether each set of events is independent or dependent. Explain your answer.

31. You pick a bottle from a basket containing chilled drinks, and then your friend chooses a bottle.
32. You roll a 6 on a number cube and you toss a coin that lands heads up.

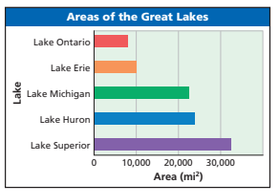
31, 32. See Additional Answers.

33. A number cube is rolled three times. What is the probability of rolling three numbers greater than 4? $\frac{1}{27}$
34. An experiment consists of randomly selecting a marble from a bag, replacing it, and then selecting another marble. The bag contains 3 blue marbles, 2 orange marbles, and 5 yellow marbles. What is the probability of selecting a blue marble and then a yellow marble? $\frac{3}{20}$
35. Madeleine has 3 nickels and 5 quarters in her pocket. She randomly chooses one coin and does not replace it. Then she randomly chooses another coin. What is the probability that she chooses two quarters? $\frac{5}{14}$

Extra Practice Chapter 10 ■ Applications Practice

Geography **Use the following information for Exercises 1–3.**

The bar graph shows the areas of the Great Lakes. *(Lesson 10-1)*



1. Estimate the difference in the areas between the lake with the greatest area and the lake with the least area. 25,000 mi²
2. Estimate the total area of the five lakes. 94,000 mi²
3. Approximately what percent of the total area is Lake Superior? about 33%
4. The scores of 18 students on a Spanish exam are given below. Use the data to make a stem-and-leaf plot. *(Lesson 10-2)* See Additional Answers.

Exam Scores									
65	94	92	75	71	83	77	73	91
82	63	79	80	77	99	76	80	88

5. The numbers of customers who visited a hair salon each day are given below. Use the data to make a frequency table with intervals. *(Lesson 10-2)* See Additional Answers.

Number of Customers Per Day						
32	35	29	44	41	25	35
40	41	32	33	28	33	34

Sports **Use the following information for Exercises 6 and 7.**

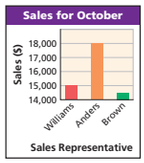
The numbers of points scored by a college football team in 11 games are given below. *(Lesson 10-3)*

10 17 17 14 21 7 10 14 17 17 21

6. Find the mean, median, mode, and range of the data set. mean: 15; median: 17; mode: 17; range: 14

7–9. See Additional Answers.

7. Use the data to make a box-and-whisker plot.
8. The weekly salaries of five employees at a restaurant are $450, $500, $460, $980, and $520. Explain why the following statement is misleading: "The average salary is $582." *(Lesson 10-4)*
9. The graph shows the sales figures for three sales representatives. Explain why the graph is misleading. What might someone believe because of the graph? *(Lesson 10-4)*



10. A manager inspects 120 stereos that were built at a factory. She finds that 6 are defective. What is the experimental probability that a stereo chosen at random will be defective? *(Lesson 10-5)* 0.05 or 5%

Travel **Use the following information for Exercises 11–13.**

A row of an airplane has 2 window seats, 3 middle seats, and 4 aisle seats. You are randomly assigned a seat in the row. *(Lesson 10-6)*

11. Find the probability that you are assigned a window seat. $\frac{2}{9}$
12. Find the odds in favor of being assigned a window seat. 2:7
13. Find the probability that you are not assigned a middle seat. $\frac{2}{3}$
14. A class consists of 19 boys and 16 girls. The teacher selects one student at random to be the class president and then selects a different student to be vice president. What is the probability that both students are girls? *(Lesson 10-7)* $\frac{24}{119}$

HOUGHTON MIFFLIN HARCOURT

Problem-Solving Handbook

Problem Solving Handbook

Draw a Diagram

You can *draw a diagram* to help you visualize what the words of a problem are describing.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE

A gardener wants to plant a 2.5-foot-wide border of flowers around a rectangular herb garden. The herb garden is 12 feet long and 7.5 feet wide. What is the area of the border?

1 Understand the Problem

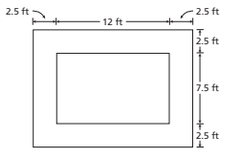
You need to find the area of the garden's border. You are given the garden's dimensions and the width of the border.

2 Make a Plan

Draw and label a diagram of the herb garden with the surrounding border. Find the dimensions of the outer rectangle. Then find the area of the inner rectangle and subtract to find the area of the border.

3 Solve

length of outer rectangle: 2.5 ft + 12 ft + 2.5 ft = 17 ft
width of outer rectangle: 2.5 ft + 7.5 ft + 2.5 ft = 12.5 ft



Find the area of each rectangle:

area of outer rectangle: 17 ft × 12.5 ft = 212.5 ft²
area of inner rectangle: 12 ft × 7.5 ft = 90 ft²

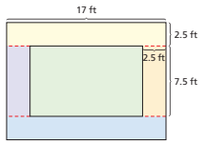
Subtract:

area of border: 212.5 ft² − 90 ft² = 122.5 ft²

4 Look Back

To check your answer, solve the problem in a different way.

Divide the border into four parts and find the area of each part. Then add the areas.



17 ft × 2.5 ft = 42.5 ft² 7.5 ft × 2.5 ft = 18.75 ft² ft²
17 ft × 2.5 ft = 42.5 ft² 7.5 ft × 2.5 ft = 18.75 ft²

42.5 ft² + 42.5 ft² + 18.75 ft² + 18.75 ft² + = 122.5 ft²

PRACTICE

1. A circular fish pond is surrounded by a circular border of stones that is 18 inches wide. The fish pond is 4 feet in diameter. What is the area of the border? (Use 3.14 for π.) **25.905 ft²**
2. Thirty-two teams are in the first round of a softball tournament. A team is eliminated as soon as it loses a game. How many games need to be played to determine the winner? (*Hint:* Use a tree diagram.) **31 games**

Make a Model

You can *make a model*, or representation of the objects in a problem, to help you solve it.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE

Mr. Duncan is using blue and white square tiles to create a pattern on his kitchen wall. The entire design will have 8 rows with 15 tiles in each row. The bottom row alternates colors starting with blue, and the row above that alternates colors starting with white. He will continue this alternating pattern so that the same two colors are never next to each other. How many of each color tile does Mr. Duncan need to complete the entire design?

1 Understand the Problem

You need to find how many of each color tile are needed. You know the number of rows and the number of tiles in each row. The colors alternate so that the same two colors are never next to each other.

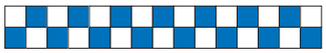
2 Make a Plan

Use blocks (preferably blue and white, but any two colors would work) to make a model of the first two rows. Count how many of each color you use. Then multiply to find how many of each color would be used in the entire design.

3 Solve

Create the bottom row. Start with a blue block and alternate colors across the row until you have used 15 blocks.

Create the row above the bottom row. Start with a white block.



You could build all 8 rows and just count the number of each color, but each group of two rows will be the same, so this way is quicker.

There will be a total of 8 rows: 4 that start with blue and 4 that start with white. Count how many of each color are used above and multiply each number by 4.

blue: 15 × 4 = 60
white: 15 × 4 = 60

Mr. Duncan needs 60 blue tiles and 60 white tiles.

4 Look Back

The grid is 15 units by 8 units, so there are 15 × 8 = 120 squares in the grid. Add the number of blue and white tiles to see if the sum is 120: 60 + 60 = 120.

PRACTICE **36 blue tiles, 24 green tiles, 60 white tiles**

1. Mr. Duncan decides to tile another area of his kitchen wall. This design will have 12 rows with 10 tiles in each row. The bottom row will repeat this pattern: blue, white, blue, blue, white. The row above the bottom row will repeat this pattern: white, green, white, white, green. He will use these two patterns for each of the remaining rows so that the first colors of each row always alternate. How many of each color tile will Mr. Duncan need?

Guess and Test

The *guess and test* strategy can be used when you cannot think of another way to solve the problem. Begin by making a reasonable guess, and then test it to see whether your guess is correct. If not, adjust the guess accordingly and test again. Keep guessing and testing until you correctly solve the problem.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE

The manager of a college computer lab purchased 24 printers at a total cost of $3120. Some of the printers were laser, and some were ink jet. The laser printers cost $250 each, and the ink jet printers cost $70 each. How many of each type of printer did the manager purchase?

1 Understand the Problem

You know the cost of each type of printer and the total number of printers. You need to find the number of each type of printer purchased.

2 Make a Plan

Make reasonable first guesses for each type of printer. The sum must be 24. Then multiply each guess by the cost of each printer. Find the total and compare it to $3120. Adjust the guess as needed and continue until you find the solution.

3 Solve

Use a table to organize your guesses.

	Laser Printers	Ink Jet Printers	Total Printers	Total Cost	
1st guess	12	12	24	12($250) + 12($70) $3000 + $840 = $3840	*Too high—try fewer laser printers.*
2nd guess	6	18	24	6($250) + 18($70) $1500 + $1260 = $2760	*Too low—try more laser printers.*
3rd guess	8	16	24	8($250) + 16($70) $2000 + $1120 = $3120	*Correct!*

The manager purchased 8 laser printers and 16 ink jet printers.

4 Look Back

The total spent is $3120, and the total number of printers is 24. The solution is correct.

PRACTICE

1. All 350 seats were sold for a concert in the park. Adult tickets cost $15, and child tickets cost $5. Ticket sales totaled $4350. How many of each type of ticket were sold? **260 adult tickets and 90 child tickets**
2. Jane is 3 times as old as Theo. Luke is 5 years older than Theo. Zoe is 8 years younger than twice Theo's age, and Cassie is 6 years younger than Theo. The sum of their ages is 71. How old is each person? **Jane is 30, Theo is 10, Luke is 15, Zoe is 12, and Cassie is 4.**

Work Backward

You can *work backward* to solve a problem when you know the ending value and are asked to find the initial value.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE

Lee Ann is taking a vacation in Paris, France. Her flight arrived in Paris at 9:35 A.M. on Tuesday. The plane left New York City and flew for 7 hours and 55 minutes to Nice, France, where there was a layover of 1 hour 12 minutes. From Nice the plane flew 1 hour and 25 minutes to Paris. Paris time is 6 hours ahead of New York City time. What time did the plane leave New York City?

1 Understand the Problem

You are asked to find the time that the plane left New York City. You know when the flight arrived in Paris, the length of the stops that were made along the way, and the time difference between New York City and Paris.

2 Make a Plan

Work backward from the time the plane arrived in Paris, using inverse operations. Then apply the time difference between the two cities.

3 Solve

Subtract the length of time it took to fly from Nice to Paris from the time Lee Ann arrived in Paris.
9:35 A.M. − 1 hour 25 minutes = 8:10 A.M.
Subtract the length of the layover in Nice.
8:10 A.M. − 1 hour 12 minutes = 6:58 A.M.
Subtract the length of the flight from New York to Nice.
6:58 A.M. − 7 hours 55 minutes = 11:03 P.M. Monday
Since Paris time is ahead of New York time, subtract the time difference.
11:03 P.M., Monday − 6 hours = 5:03 P.M. Monday
Lee Ann's flight left New York City on Monday at 5:03 P.M.

4 Look Back

Work forward to check your answer.
5:03 P.M. Monday + 6 h + 7 h 55 min + 1 h 12 min + 1 h 25 min
= 5:03 P.M. Monday + 16 h 32 min
= 9:35 A.M. Tuesday
This matches the information given in the problem.

PRACTICE

1. A bus arrives in Dallas, Texas, at 10:59 A.M. on Friday. The bus left Atlanta, Georgia, and took 12 hours and 15 minutes to arrive in Shreveport, Louisiana, where there was a 45-minute layover. From Shreveport it took 4 hours and 29 minutes to get to Dallas. Dallas time is 1 hour behind Atlanta time. What time did the bus leave Atlanta? **6:30 P.M. on Thursday**
2. Carolina bought a DVD player that was on sale for 90% of the original price. The total amount she paid was $135.72, which included a sales tax of $5.22. What was the original price of the DVD player? **$145.00**

Find a Pattern

If a problem involves a sequence of numbers or figures, it is often necessary to find a pattern to solve the problem.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE

Darian created the following sequence of stars:

How many stars will be in the 6th figure?

1 Understand the Problem

You need to find the number of stars in the 6th figure. You can find the number in the first four figures by counting.

2 Make a Plan

Count the number of stars in each of the first four figures. Use the information to find a pattern and determine a general rule.

3 Solve

Look for a pattern between the position of each figure in the sequence and the number of stars in that figure.

Position	1	2	3	4
Stars	2	6	12	20

The number of stars is the square of the position number plus the position number. This rule written algebraically is $n^2 + n$.

Evaluate the expression for $n = 6$: $n^2 + n$

$6^2 + 6 = 36 + 6 = 42$

There will be 42 stars in the 6th figure.

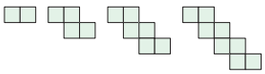
4 Look Back

Look for another pattern. The number of stars in each position increases by 4, then by 6, then by 8. That is, the amount of increase always increases by 2. So the number of stars in the 5th position will be 20 + 10, or 30, and the number of stars in the 6th position will be 30 + 12, or 42.

PRACTICE

1. The first three figures of a pattern are shown. How many circles will be in the 10th figure? **37**

2. Lily drew the first four figures of a pattern. How many squares will be in the 7th figure? **14**



Make a Table

You can make a table to solve problems because the rows and columns can help you arrange information. Sometimes this also allows you to discover relationships that might otherwise be hard to notice.

Problem Solving Strategies

Draw a Diagram	**Make a Table**
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE

A scientist begins a culture with 500 bacteria. The number of bacteria triples every 30 minutes. How many bacteria are in the culture after $2\frac{1}{2}$ hours?

1 Understand the Problem

You are asked to find the number of bacteria in the culture after $2\frac{1}{2}$ hours. You know the initial number of bacteria, and you know that the population triples every half hour.

2 Make a Plan

Make a table with rows for time and number of bacteria. Start with the initial number in the culture. Increase the time in 30-minute increments and triple the number of bacteria with each increase. Keep extending the table until the time is $2\frac{1}{2}$ hours (150 minutes).

3 Solve

Time (min)	0	30	60	90	120	150
Bacteria	500	1500	4500	13,500	40,500	121,500

There are 121,500 bacteria in the culture after $2\frac{1}{2}$ hours.

4 Look Back

Check your answer by solving a simpler problem. The number of bacteria in the culture triples five times (150 min ÷ 30 min = 5). Start with 5 instead of 500 and triple the number five times.

$5 \times 3 = 15$

$15 \times 3 = 45$

$45 \times 3 = 135$

$135 \times 3 = 405$

$405 \times 3 = 1215$

Multiply by 100 to find the total if you had started with 500; $1215 \times 100 = 121{,}500$

PRACTICE

1. A dietician's report states that a 125-pound woman needs to eat about 1750 Calories a day to maintain her weight. It also states that a 132-pound woman needs 1848 Calories and a 139-pound woman needs 1946 Calories a day. Based on these values, how many Calories does a 160-pound woman need to eat each day to maintain her weight? **2240 Calories**
2. Simon opened a savings account with an initial deposit of $200. At the end of each year, the account earns 4% interest. If he does not deposit or withdraw any additional money, what would his balance be at the end of 6 years? **$253.06**

Solve a Simpler Problem

Sometimes a problem contains numbers that make it seem difficult to solve. You can solve a simpler problem by rewriting the numbers so they are easier to compute.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	**Solve a Simpler Problem**
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE

During a skating competition, Jules skated around the track 35 times. One lap is 0.9 mile. If Jules finished in 1 hour 30 minutes, what was his average speed?

1 Understand the Problem

You are asked to find Jules's average speed for 35 laps. You know the distance of each lap and the amount of time it took him to finish the competition.

2 Make a Plan

Solve a simpler problem by using easier numbers to do the computations.

3 Solve

Find the total distance skated.

$35(0.9)$ *There were 35 laps that measured 0.9 mile.*

$35(1 - 0.1)$ *Write 0.9 as 1 − 0.1*

$35(1) - 3.5(0.1)$ *Use the Distributive Property.*

$35 - 3.5$

31.5

Use the distance formula to find the average speed.

$d = rt$

$31.5 = r \times 1.5$ *1 hour 30 minutes = 1.5 hours*

$\frac{31.5}{1.5} = r$ *Solve for r.*

$\frac{315}{15} = r$ *Multiply the numerator and denominator by 10 to eliminate the decimals.*

$\frac{1}{15}(315) = r$

$\frac{1}{15}(300 + 15) = r$ *Write 315 as 300 + 15.*

$\frac{1}{15}(300) + \frac{1}{15}(15) = r$ *Use the Distributive Property.*

$20 + 1 = r$

$21 = r$

Jules skated at an average speed of 21 miles per hour.

4 Look Back

Each lap is a little less than 1 mile, so 35 laps is a little less than 35 miles. Round this distance to 30 miles and use $d = rt$ to find the rate when the time is 1.5 hours: 30 mi = $(1.5 \text{ h})r \longrightarrow r = 20$ mi/h. This is close to 21 mi/h.

PRACTICE

1. Diana swam 24 laps in the pool today. One lap is 200 feet. She swam at an average rate of 4 feet per second. How many minutes did Diana swim? **20 min**

Use Logical Reasoning

Use logical reasoning to solve problems when you are given several facts and can use common sense to find a missing fact.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	**Use Logical Reasoning**
Work Backward	Use a Venn Diagram
Find a Pattern	Make an Organized List

EXAMPLE 1

Five players on a baseball team wear the numbers 2, 12, 15, 34, and 42. Their positions are pitcher, catcher, first base, left field, and center field. The pitcher's number is less than the left fielder's number. The center fielder's number is greater than 25, and the left fielder wears an even number. The catcher wears number 34. What is the pitcher's number?

1 Understand the Problem

You want to find the jersey number of the pitcher. You know there are five positions and five jersey numbers. Some information about who wears which number is given.

2 Make a Plan

Organize the information in a table. Start with the fact that the catcher wears number 34 and use logical reasoning to determine the numbers of the other positions.

3 Solve

The catcher wears number 34. No other player wears 34, and the catcher wears no other number. Enter *Y's* and *N's* in the chart as shown.

The center fielder's number is greater than 25, so he must wear number 42. The left fielder cannot wear number 15 (because it is odd), and he cannot have the least number (the pitcher's number is less than his). The left fielder must wear 12.

The pitcher's number is less than 12 (the left fielder's), so he must wear number 2.

	2	12	15	34	42
Pitcher	Y	N	N	N	N
Catcher	N	N	N	Y	N
First Base	N	N	Y	N	N
Left Fielder	N	Y	N	N	N
Center Fielder	N	N	N	N	Y

Y = yes; N = no

Once you enter Y in a cell, enter N in the remaining cells for the row and the column that include it.

The pitcher wears number 2.

4 Look Back

Complete the chart if needed. Read the problem while looking at the chart to make sure there are no contradictions.

PRACTICE

1. Rose, Jill, Gaby, and Chloe bowled the scores 110, 125, 144, and 150. Jill did not bowl the 110. The person who bowled the 150 is Rose's sister and Jill's aunt. Chloe bowled the 125. What score did Jill bowl? **144**

Use a Venn Diagram

You can use a Venn diagram to display relationships among sets of numbers. Circles are used to represent the individual sets.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	**Use a Venn Diagram**
Find a Pattern	Make an Organized List

EXAMPLE

At a local supermarket, 194 people were given samples of two brands of orange juice. Their opinions were as follows: 120 people liked brand A, 101 people liked brand B, and 15 people did not like either brand. How many people liked only brand A?

1 Understand the Problem

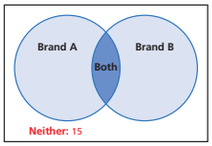
The total number of people was 194, and 15 of them did not like either brand. The statement "120 people liked brand A" means some of the 120 people liked *only* brand A and some liked brand A *and* brand B. The statement "101 people liked brand B" means some of the 101 people liked *only* brand B and some liked brand A *and* brand B.

2 Make a Plan

Use a Venn diagram to show the relationship among the groups of people.

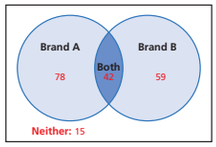
3 Solve

Draw and label two intersecting circles to show the sets of people who liked brand A and brand B. Write 15 in the area labeled "Neither."



Out of 194 people, 15 liked neither brand. Subtract 15 from 194 to find how many people liked at least one brand: $194 - 15 = 179$.

Add the number of people who liked brand A to the number of people who liked brand B: $120 + 101 = 221$. You know there are only 179 people who liked at least one brand, so subtract 179 from 221: $221 - 179 = 42$. This means 42 people were counted twice, and that 42 people liked both brands. Write 42 in the area labeled both.



Out of 120 people who liked brand A, 42 also liked brand B. Subtract 42 from 120 to find the number of people who liked only brand A: $120 - 42 = 78$.

So 78 people liked only brand A.

4 Look Back

Find the number of people who liked brand B only: $101 - 42 = 59$. Add all the numbers in the Venn diagram. The sum of the number who liked only brand A, the number who liked only brand B, the number who liked both brands, and the number who liked neither brand should be the total number of people surveyed: $78 + 59 + 42 + 15 = 194$.

PRACTICE

In a group of 138 people, 55 own a cat, 27 own a cat and a dog, and 42 own neither pet.

1. How many people own only a cat? **28**
2. How many people own a dog? **68**

Make an Organized List

If a problem asks you to find all the possible ways in which something can happen, you can make an organized list to keep track of the outcomes.

Problem Solving Strategies

Draw a Diagram	Make a Table
Make a Model	Solve a Simpler Problem
Guess and Test	Use Logical Reasoning
Work Backward	Use a Venn Diagram
Find a Pattern	**Make an Organized List**

EXAMPLE

A fair coin is tossed 4 times. What is the probability that it lands heads up at least 3 times?

1 Understand the Problem

You need to find the probability that a coin tossed 4 times lands heads up 3 or 4 times.

2 Make a Plan

The formula for probability is:

$$\text{probability} = \frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$$

The total number of outcomes is the number of items in the list. The number of favorable outcomes is the number of times the coin lands heads up 3 or 4 times.

Make an organized list of the coin tosses to find the total number of outcomes.

3 Solve

Start with heads for all 4 tosses, then heads for the first 3 tosses, then heads for the first 2 tosses, and then heads for the first toss. Repeat the pattern for tails.

HHHH	HTHH	TTTT	THTT	*There are 16 total outcomes.*
HHHT	HTHT	TTTH	THTH	
HHTH	HTTH	TTHT	THHT	*There are 5 favorable outcomes.*
HHTT	HTTT	TTHH	THHH	

The probability that the coin lands heads up 3 or 4 times is $\frac{5}{16}$.

4 Look Back

Double-check that each combination is listed and that no combination is written more than once. You can also use the Fundamental Counting Principle to check the total number of outcomes. For each of the 4 coin tosses, there are 2 possible outcomes, so the total number of outcomes is $2 \times 2 \times 2 \times 2 = 16$.

PRACTICE

1. A beagle, a fox terrier, an Afghan hound, and a golden retriever are competing in the finals of a dog show. How many ways can the dogs finish in first, second, and third place? **24**
2. Two number cubes are rolled. What is the probability that the sum of the numbers rolled is an odd number? $\frac{1}{2}$

Graphic Organizer Answers

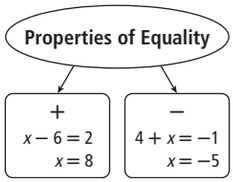
Possible answers given.

Chapter 1

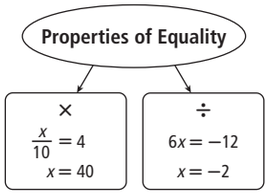
Lesson 1-1

	Words	Algebra
Addition	3 more than x	$x + 3$
Subtraction	1 less than y	$y - 1$
Multiplication	The product of 2 and n	$2n$
Division	The quotient of x and 4	$x \div 4$

Lesson 1-2



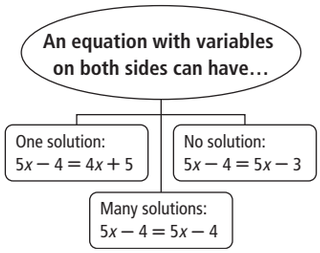
Lesson 1-3



Lesson 1-4

Solving Multi-Step Equations	
$2x + 1 = 9$	$\frac{x}{3} - 2 = 1$
$2x = 8$	$\frac{x}{3} = 3$
$x = 4$	$x = 9$

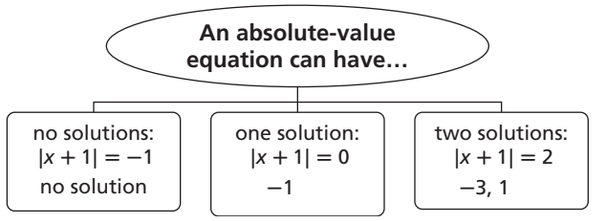
Lesson 1-5



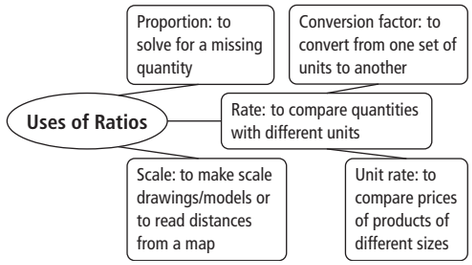
Lesson 1-6

Common Formulas	
Subject	**Formula**
Geometry	$P = 4s$; $s = \frac{P}{4}$ (perimeter of a square is 4 times the side length)
Physical science	$F = ma$; $m = \frac{F}{a}$; $a = \frac{F}{m}$ (force equals mass times acceleration)
Earth science	$K = C + 273$; $C = K - 273$ (temperature in kelvins is Celsius temperature plus 273)

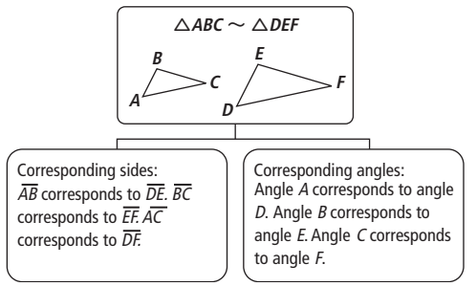
Lesson 1-7



Lesson 1-8

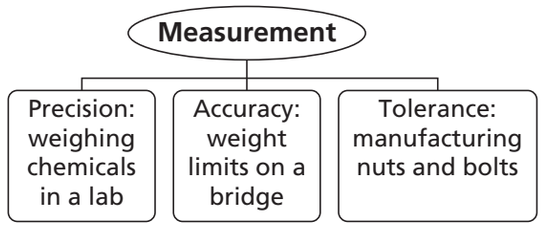


Lesson 1-9



Lesson 1-10

3.



Graphic Organizer Answers

Possible answers given.

Chapter 2

Lesson 2-1

Inequality	Graph
$x > 1$	−1 0 1 2 3 4 5
$x \leq -3$	−5 −4 −3 −2 −1 0 1

Lesson 2-2

Properties of Inequality

Addition:

$a - 4 < 9$

$+4 \quad +4$

$a < 13$

12 13 14 15

Subtraction:

$a + 5 > 10$

$-5 \quad -5$

$a > 5$

3 4 5 6 7

Lesson 2-3

Solving Inequalities by Using Multiplication and Division		
	By a positive number	**By a negative number**
Divide	$2x < 8$ $\frac{2x}{2} < \frac{8}{2}$ $x < 4$	$-3x > 9$ $\frac{-3x}{-3} < \frac{9}{-3}$ $x < -3$
Multiply	$\frac{x}{4} \leq 4$ $\frac{x}{4}(4) \leq 4(4)$ $x \leq 16$	$\frac{x}{-5} \geq 2$ $\frac{x}{-5}(-5) \leq 2(-5)$ $x \leq -10$

Lesson 2-4

Solving Multi-Step Equations and Inequalities

How are they alike? To solve multi-step equations or inequalities, follow the order of operations to simplify the expressions on both sides of the equal sign or inequality symbol, and then undo each operation.

How are they different? When solving multi-step inequalities, you must reverse the inequality symbol if you multiply or divide both sides by a negative number. There are many solutions of an inequality but usually only one solution of an equation.

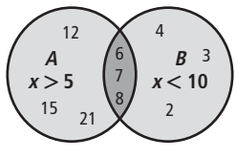
Lesson 2-5

Solutions of Inequalities with Variables on Both Sides

All real numbers: $x + 2 < x + 5$

No solutions: $x + 5 > x + 9$

Lesson 2-6



$x > 5$ AND $x < 10$	$x > 5$ OR $x < 10$
6 7 8	2 3 4 6 7 8 12 15 21

Lesson 2-7

Absolute-Value Inequalities

AND
$|x| < 5$
$-5 < x < 5$

OR
$|x| > 4$
$x > 4$ or $x < -4$

Graphic Organizer Answers

Possible answers given.

Chapter 3

Lesson 3-1

Key Words for Graph Segments

Increases: rise, grow, go up	Decreases: drop, go down	Stays the same: unchanged, constant

Lesson 3-2

A relation is …	
a function if … there is exactly one range element for each domain element.	not a function if … there is more than one range element for a domain element.

Lesson 3-3

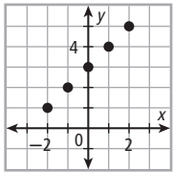
Ways to Represent Functions

Equation in function notation: $f(x) = x + 3$

Table:

x	y
−2	1
−1	2
0	3
1	4
2	5

Graph:



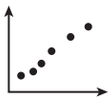
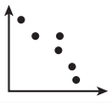
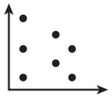
Lesson 3-4

Graphing a Function

Not a real-world situation: Use a domain of all real numbers. Choose some values for x, and use the function to find corresponding values for y. Plot the points and connect them with a line or smooth curve.

Real-world situation: Use a domain that makes sense in the given situation. Choose some values for x, and use the function to find corresponding values for y. Plot the points and, if it makes sense in the situation, connect them with a line or smooth curve.

Lesson 3-5

	Graph	Example
Positive Correlation		the total price of an ice cream cone and the number of scoops
Negative Correlation		the amount of water in a watering can and the number of flowers watered
No Correlation		the number of magazines a person has and the size of the person's shoes

Lesson 3-6

Finding the nth Term of an Arithmetic Sequence → 1. Find the common difference. → 2. Write a rule to find the nth term.

Graphic Organizer Answers

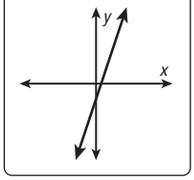
Possible answers given.

Chapter 4

Lesson 4-1

Determining Whether a Function Is Linear

- From its graph: All the points form a line.



- From its equation: It can be written in standard form, $Ax + By = C$, where A and B are not both 0.

  Example: $6x + 2y = -2$

- From a list of ordered pairs: A constant change in x corresponds to a constant change in y.

	x	y	
+1	0	6	−3
+1	1	3	−3
	2	0	

Lesson 4-2

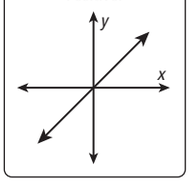
Graphing $Ax + By = C$ Using Intercepts

1. Find the x-intercept by letting y equal 0 and solving for x.
2. Find the y-intercept by letting x equal 0 and solving for y.
3. Graph the line by plotting the points containing the intercepts and then connecting the points with a straight line.

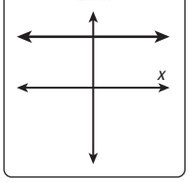
Lesson 4-3

Slope

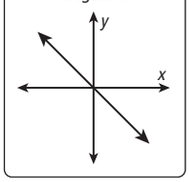
- Positive:



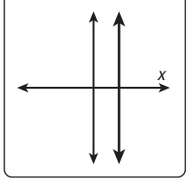
- Zero:



- Negative:



- Undefined:



Lesson 4-4

Finding Slope

- From a graph: Begin at any point on the line. Count rise and run to another point on the line. Slope is the ratio of rise to run.
- From a table: Choose any two points from the table and substitute their coordinates into the slope formula.
- From an equation: Find the x- and y-intercepts. Substitute the points containing the intercepts into the slope formula.

Lesson 4-5

Recognizing a Direct Variation

From an Equation:	From Ordered Pairs:	From a Graph:
The equation can be written in the form $y = kx$ for some nonzero value of k.	An equation describing the ordered pairs can be written in the form $y = kx$. Also, the ratio $\frac{y}{x}$ is constant for each ordered pair.	The graph is a line through (0, 0).

Lesson 4-6

Graphing the Line Described by $y = mx + b$

1. Plot the point $(0, b)$.
2. Find a second point on the line by using the slope m to move horizontally and vertically from $(0, b)$.
3. Draw the line connecting the two points.

Lesson 4-7

Writing the Equation of a Line

- If you know two points on the line: Use the two points in the slope formula to find the slope. Then use the slope and one of the points to write the equation in point-slope form.
- If you know the slope and y-intercept: If the slope is m and the y-intercept is b, then the equation is $y = mx + b$.
- If you know the slope and a point on the line: Use the slope and the point to write the equation in point-slope form.

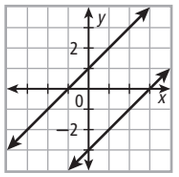
Lesson 4-8

2. Possible answer:

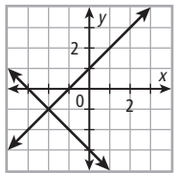
***r*-value**	−0.9	−0.4	0	0.4	0.9
Scatter Plot					
Description of Correlation	Strong negative	Weak negative	none	Weak positive	Strong positive

Lesson 4-9

- Parallel lines: same slopes

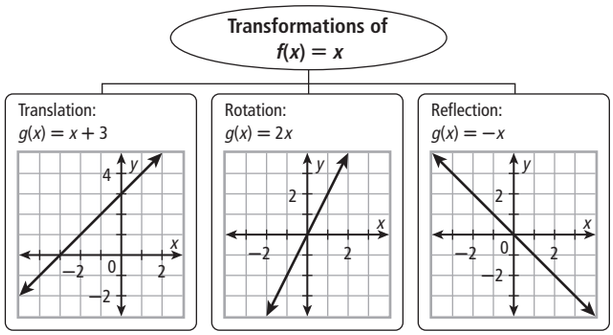


- Perpendicular lines: Product of slopes is −1.



Graphic Organizer Answers

Lesson 4-10



Graphic Organizer Answers

Possible answers given.

Chapter 5

Lesson 5-1

Solving a Linear System by Graphing

1. Graph the first and second equation.
2. Identify the point of intersection.
3. Check the solution.

Lesson 5-2

The solution for each is $(5, 3)$.

$\begin{cases} x + y = 8 \\ x - y = 2 \end{cases}$

Solve $x + y = 8$ for x.

$x + y = 8$
$x = -y + 8$
$(-y + 8) - y = 2$
$-2y + 8 = 2$
$-2y = -6$
$y = 3$

$x + 3 = 8$
$x = 5$
$(5, 3)$

Solve $x + y = 8$ for y.

$x + y = 8$
$y = -x + 8$
$x - (-x + 8) = 2$
$x + x - 8 = 2$
$2x - 8 = 2$
$2x = 10$
$x = 5$

$5 + y = 8$
$y = 3$
$(5, 3)$

Solve $x - y = 2$ for x.

$x - y = 2$
$x = y + 2$
$(y + 2) + y = 8$
$2y + 2 = 8$
$2y = 6$
$y = 3$

$x - 3 = 2$
$x = 5$
$(5, 3)$

Solve $x - y = 2$ for y.

$x - y = 2$
$-y = -x + 2$
$y = x - 2$
$x + (x - 2) = 8$
$2x - 2 = 8$
$2x = 10$
$x = 5$

$5 - y = 2$
$-y = -3$
$y = 3$
$(5, 3)$

Lesson 5-3

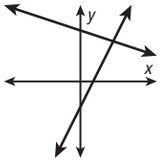
Solving Systems of Linear Equations

- Substitution: $\begin{cases} x = 5y \\ x + y = 10 \end{cases}$
- Elimination using addition or subtraction: $\begin{cases} 4x + y = 1 \\ 2x - y = 7 \end{cases}$
- Elimination using multiplication: $\begin{cases} 2x + 6y = 10 \\ x + y = -2 \end{cases}$

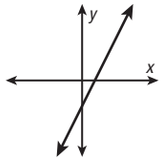
Lesson 5-4

Linear System of Equations

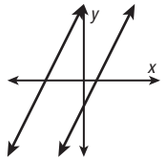
- Exactly one solution: independent; possible graph:



- Infinitely many solutions: dependent; possible graph:



- No solution: inconsistent; possible graph:

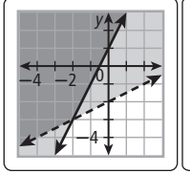


Lesson 5-5

Inequality	$y < 5x + 2$	$y > 7x - 3$	$y \leq 9x + 1$	$y \geq -3x - 2$
Symbol	$<$	$>$	$\leq$	$\geq$
Boundary Line	Dashed	Dashed	Solid	Solid
Shading	Below	Above	Below	Above

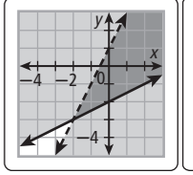
Lesson 5-6

$\begin{cases} y \geq 2x + 1 \\ y > \frac{1}{2}x - 2 \end{cases}$



Possible answer: $(-4, -4)$

$\begin{cases} y < 2x + 1 \\ y \geq \frac{1}{2}x - 2 \end{cases}$



Possible answer: $(0, 0)$

Graphic Organizer Answers

Possible answers given.

Chapter 6

Lesson 6-1

Simplifying Expressions with Negative Exponents

- For a negative exponent in the numerator, move the power to the denominator and change the negative exponent to a positive exponent; possible answer: $2^{-3} = \frac{1}{2^3}$.
- For a negative exponent in the denominator, move the power to the numerator and change the negative exponent to a positive exponent; possible answer: $\frac{4}{x^{-5}} = 4x^5$.

Lesson 6-2

Exponent	Definition	Numerical Example
$b^{\frac{1}{n}}$	A number raised to the power of $\frac{1}{n}$ is equal to the nth root of that number.	$36^{\frac{1}{2}} = \sqrt{36} = 6$
$b^{\frac{m}{n}}$	A number raised to the power of $\frac{m}{n}$ is equal to the nth root of that number raised to the mth power.	$36^{\frac{3}{2}} = \left(\sqrt{36}\right)^3 = 6^3 = 216$

Lesson 6-3

Polynomials

- **Monomials** x^2
- **Binomials** $3x + 2$
- **Trinomials** $2x^2 + 6x - 7$

Lesson 6-4

Polynomials

Adding:
$(18a^2b + 9a^2 + b) + (7a^2b + 6a^2 + 2b) =$
$25a^2b + 15a^2 + 3b$

Subtracting:
$(16m^5n - 8m + 12) - (2m^5n + m - 1) =$
$(16m^5n - 8m + 12) + (-2m^5n - m + 1) =$
$14m^5n - 9m + 13$

Lesson 6-5

Multiplying Polynomials

Distributive Property:
$5x(x + 2) =$
$5x^2 + 10x$

FOIL method:
$(x + 1)(x + 2) =$
$x^2 + 2x + x + 2 =$
$x^2 + 3x + 2$

Rectangle model:
$(x + 2)(x^2 + 2x + 1)$

	x^2	$+ 2x$	$+ 1$
x	x^3	$2x^2$	x
$+ 2$	$2x^2$	$4x$	2

$x^3 + 4x^2 + 5x + 2$

Vertical method:
$(x + 2)(x^2 + 3x + 2)$

$$\begin{array}{r} x^2 + 3x + 2 \\ \times \quad\quad x + 2 \\ \hline 2x^2 + 6x + 4 \\ + \; x^3 + 3x^2 + 2x \\ \hline x^3 + 5x^2 + 8x + 4 \end{array}$$

Lesson 6-6

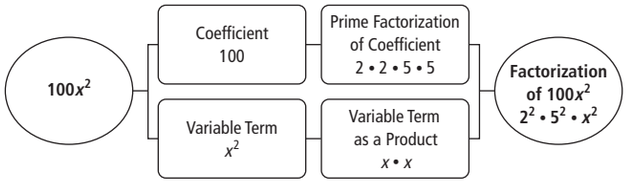
Special Products of Binomials		
Perfect-Square Trinomials		Difference of Two Squares
$(a + b)^2 = a^2 + 2ab + b^2$ $(x + 4)^2 = x^2 + 8x + 16$	$(a - b)^2 = a^2 - 2ab + b^2$ $(x - 4)^2 = x^2 - 8x + 16$	$(a + b)(a - b) = a^2 - b^2$ $(x + 4)(x - 4) = x^2 - 16$

Graphic Organizer Answers

Possible answers given.

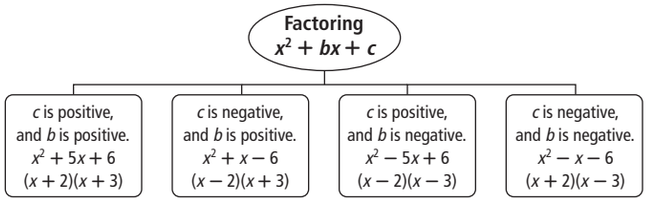
Chapter 7

Lesson 7-1



Lesson 7-2

Lesson 7-3



Lesson 7-4

Factoring $ax^2 + bx + c$	
$c > 0$	
$b > 0$	$b < 0$
$3x^2 + 10x + 8 = (3x + 4)(x + 2)$	$3x^2 - 10x + 8 = (3x - 4)(x - 2)$
$c < 0$	
$b < 0$	$b > 0$
$3x^2 - 10x - 8 = (3x + 2)(x - 4)$	$3x^2 + 10x - 8 = (3x - 2)(x + 4)$

Lesson 7-5

Special Product	Factored Form
Perfect-square trinomial with positive coefficient of middle term: $x^2 + 2x + 1$	$(x + 1)^2$
Perfect-square trinomial with negative coefficient of middle term: $x^2 - 2x + 1$	$(x - 1)^2$
Difference of two squares: $x^2 - 1$	$(x - 1)(x + 1)$

Lesson 7-6

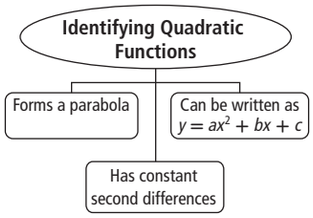
Factoring Methods	
Polynomial	**Method**
1. $16x^4 - 25y^8$	**A.** Factoring out the GCF
2. $x^2 + 10x + 25$	**B.** Factoring by grouping
3. $9t^2 + 27t + 18t^4$	**C.** Unfactorable
4. $a^2 + 3a - 7a - 21$	**D.** Difference of two squares
5. $100b^2 + 81$	**E.** Perfect-square trinomial

Graphic Organizer Answers

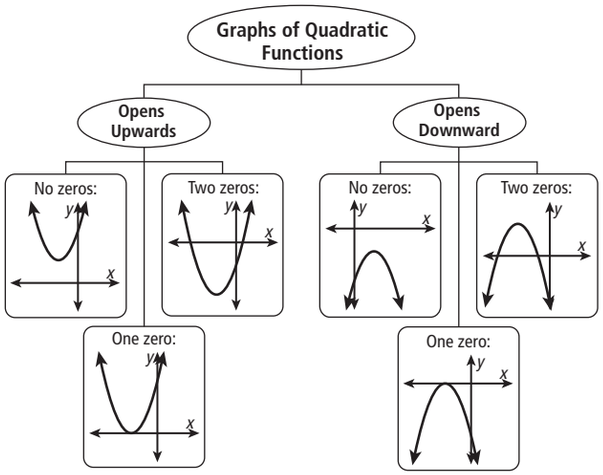
Possible answers given.

Chapter 8

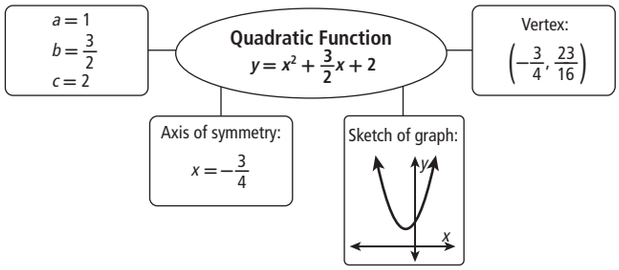
Lesson 8-1



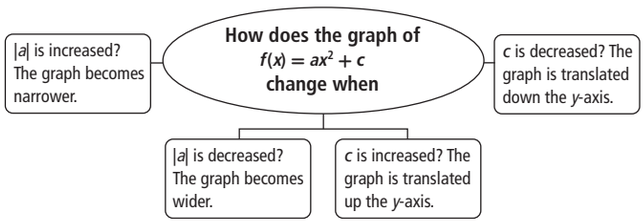
Lesson 8-2



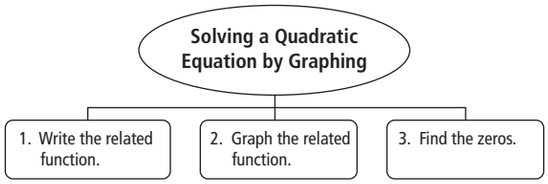
Lesson 8-3



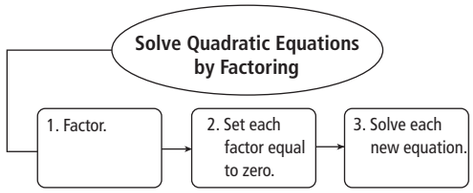
Lesson 8-4



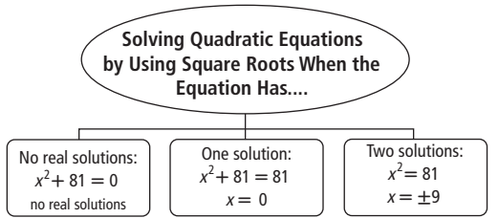
Lesson 8-5



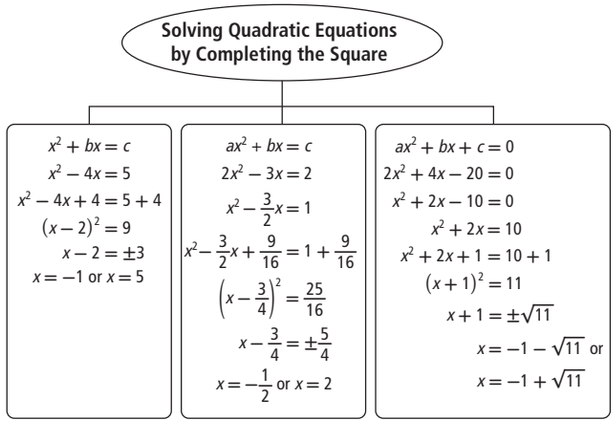
Lesson 8-6



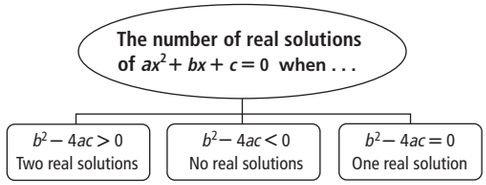
Lesson 8-7



Lesson 8-8



Lesson 8-9



Lesson 8-10

System of Equations	Number of Solutions			
	0	1	2	infinite
Linear			not possible	
Linear/Quadratic				not possible

Graphic Organizer Answers

Possible answers given.

Chapter 9

Lesson 9-1

Ways to Represent Geometric Sequence 1, 2, 4, 8, ...

Table

Position	Term
1	1
2	2
3	4
4	8

Formula

$a_n = 1(2)^{n-1}$

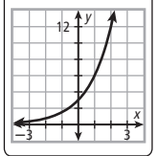
Words

Start with 1 and multiply each term by 2 to get the next term.

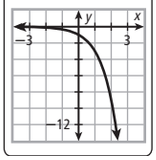
Lesson 9-2

Exponential Functions: $y = ab^x$

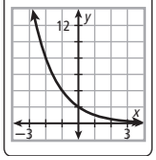
$a > 0, b > 1$: $y = 3(2)^x$



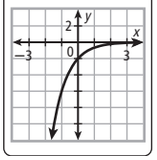
$a < 0, b > 1$: $y = -1(3)^x$



$a > 0, 0 < b < 1$: $y = 2\left(\frac{1}{2}\right)^x$



$a < 0, 0 < b < 1$: $y = -2\left(\frac{1}{3}\right)^x$



Lesson 9-3

Exponential Growth vs. Exponential Decay

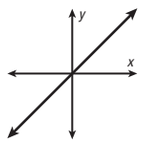
How are they alike?
Both are exponential functions, have a domain of all real numbers, have a range of all real numbers greater than 0, and represent a change in quantity by the same rate over time.

How are they different?
One increases over time and the other decreases over time, in one you add the rate to 1 and in the other you subtract the rate from 1.

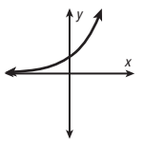
Lesson 9-4

Modeling Data

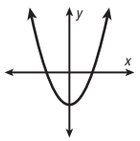
Linear: Points lie on a line; for a constant change in x, the first differences are constant.



Exponential: Smooth curve that extends infinitely either up to the right, up to the left, down to the right, or down to the left; for a constant change in x, there is a constant ratio.



Quadratic: Points lie on a parabola and are symmetric with a vertical line through the vertex; for a constant change in x, the second differences are constant.



Lesson 9-5

3. Possible answer:

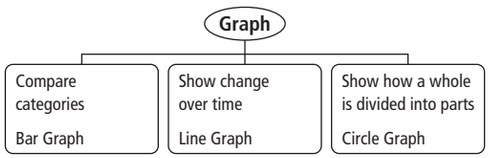
Comparing Functions			
Linear to Linear	**Exponential to Exponential**	**Quadratic to Quadratic**	**Linear to Quadratic**
Compare… slopes and y-intercepts	Compare… rates of change over different intervals	Compare… maximums or minimums, lengths, and average steepness over the interval	Compare… the graphs of the functions

Graphic Organizer Answers

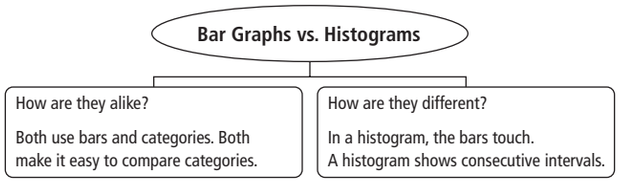
Possible answers given.

Chapter 10

Lesson 10-1



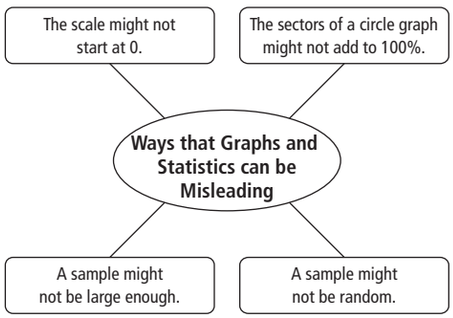
Lesson 10-2



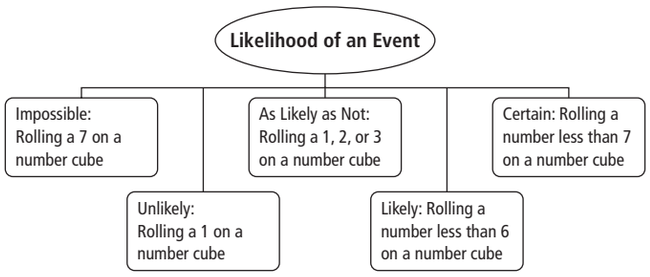
Lesson 10-3

Measures of Central Tendency	
Measure	**Use to Answer**
mean	What is the average?
median	What is the halfway point of the data?
mode	What is the most common value? (Can also be used to describe non-numerical data, such as favorite color.)

Lesson 10-4



Lesson 10-5



Lesson 10-6

$P(\text{black}) = \frac{1}{4}$
$P(\text{not black}) = \frac{3}{4}$
Odds in favor of black: 1:3
Odds against black: 3:1

Lesson 10-7

	Example	Probability
Dependent Events	From a bag that has three red marbles and three blue marbles	$P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A) = \frac{3}{6} \cdot \frac{3}{5} = \frac{9}{30} = \frac{3}{10}$
	A = choosing a red marble	
	B = choosing a blue marble	
Independent Events	A = rolling a 6 on a number cube	$P(A \text{ and } B) = P(A) \cdot P(B) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$
	B = rolling a 4 on a number cube	

Additional Answers

Chapter 1

1-1 *Exercises*

17–24. Possible answers given.

17. the product of 5 and p; 5 groups of p

18. 4 decreased by y; the difference of 4 and y

19. the sum of 3 and x; 3 increased by x

20. the product of 3 and y; 3 times y

21. negative 3 times s; the product of negative 3 and s

22. the quotient of r and 5; one-fifth r

23. 14 decreased by t; the difference of 14 and t

24. the sum of x and 0.5; x increased by 0.5

33. $2x$; possible answer: Jim has twice as many aunts as Carly, who has x aunts.

34. $17 - b$; possible answer: Sarah started with 17 apples, but lost b of them.

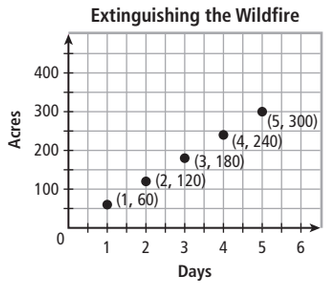
35. $y + 10$; possible answer: April had y CDs and then got 10 more.

1-2 *Exercises*

64a. Possible answer: the fire should cover twice as much area in 2 days as it does in 1, so multiply 2 by 1000 and the answer is 2000.

1-6 *Exercises*

34c.



1-8 *Check It Out!*

3. Possible answer: the cyclist travels about 60 mi in 4 h, or 15 mi/h. There are about 5000 ft in 1 mi, so this speed is equivalent to $15(5000) = 75{,}000$ ft/h. There are about 4000 s in 1 h, so this is equivalent to $\frac{75{,}000}{4000} \approx 20$ ft/s. So 20.5 ft/s is reasonable.

Extra Practice Skills

44. $\frac{1}{2}x + 3 = 17 - 3x$; $x = 4$

45. $2(x - 4) = x - 5$; $x = 3$

Additional Answers

Chapter 2

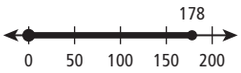
2-2 Exercises

34. Both inequalities have all numbers greater than 1 as solutions; $x + 2 \geq 3$ also includes 1. The graph of $x + 2 > 3$ has an empty circle at 1, but the graph of $x + 2 \geq 3$ has a solid circle at 1.

35a. $411 + 411 = 822$ miles

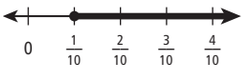
b. $822 + m \leq 1000$

c. $m \leq 178$, where m is nonnegative

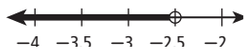


2-3 Exercises

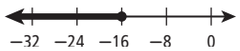
27. $b \geq \frac{1}{10}$



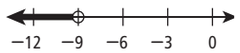
28. $p < -2.5$



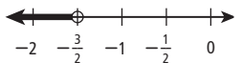
29. $b \leq -16$



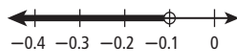
30. $a < -9$



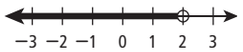
31. $r < -\frac{3}{2}$



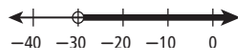
32. $p < -0.1$



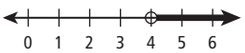
33. $y < 2$



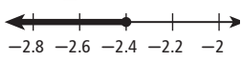
34. $f > -30$



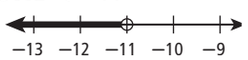
35. $t > 4$



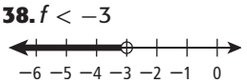
36. $w \leq -2.4$



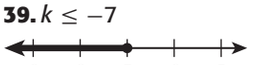
37. $z < -11$



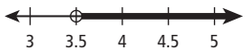
38. $f < -3$



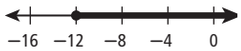
39. $k \leq -7$



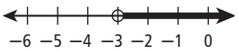
40. $b > 3.5$



41. $p \geq -12$



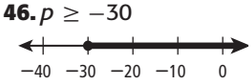
43. $x > -3$



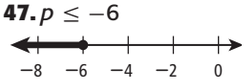
44. $t \leq 8$

45. $x < 20$

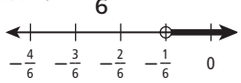
46. $p \geq -30$



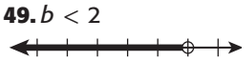
47. $p \leq -6$



48. $t > -\frac{1}{6}$



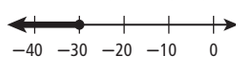
49. $b < 2$



50. $r < 60$

51.

52.



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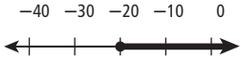

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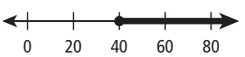


2A Ready To Go On?

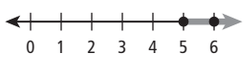
1. all real numbers greater than −2

2. all real numbers less than or equal to 8

3. all real numbers greater than or equal to 3

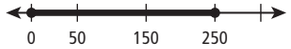
4. all real numbers greater than 1

12. $t \geq 5$ where t is a natural number



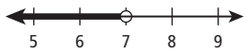
13. $a < 13$ where a is positive

14. $m \leq 250$ where m is nonnegative

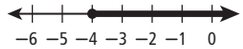


15. $k \leq 2$

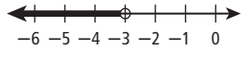
16. $p < 7$



17. $r \geq -4$



18. $p < -3$



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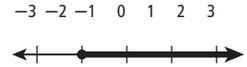

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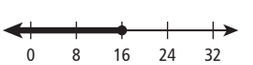
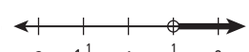


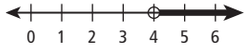
23.



24.

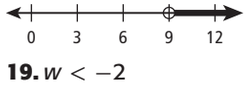
2-4 Exercises

16. $r > 4$

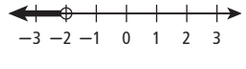


17. $x \leq 1$

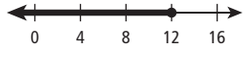
18. $w > 9$



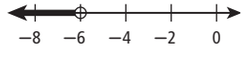
19. $w < -2$



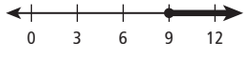
20. $v \leq 12$



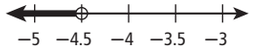
21. $x < -6$



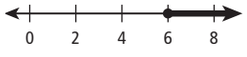
22. $z \geq 9$



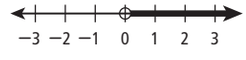
23. $f < -4.5$



24. $n \geq 6$

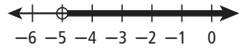


25. $w > 0$

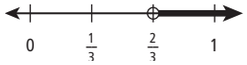


Additional Answers

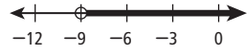
26. $p > -5$



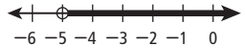
27. $v > \frac{2}{3}$



28. $x > -9$

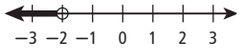


29. $x > -5$



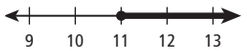
30. $h \geq 17$

31. $x < -2$



32. $x < -8$

33. $a \geq 11$

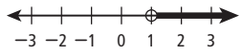


34. $x < 19$

35. $x > 3$

36. $q \leq 16$

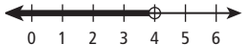
38. $x > 1$



39. $x \leq 2$

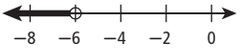
40. $x > 18$

41. $x < 4$

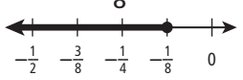


42. $x < 0$

43. $x < -6$

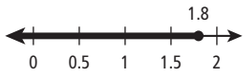


44. $m \leq -\frac{1}{8}$



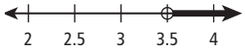
45. $r < 8$

46. $n \leq 1.8$



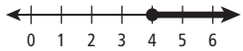
47. $x < 7$

48. $n > 3.5$

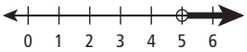


49. $p \geq 18$

68.



69.

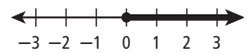


70.

71.

72.

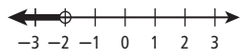
73.



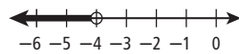
74.

75.

76.



84.



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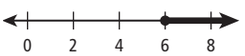
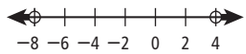


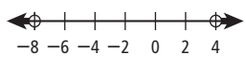
86.

2-6 Exercises

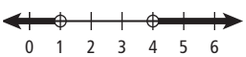
7.



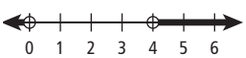
8.



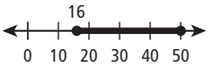
9.



10.



15.



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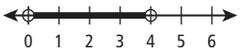

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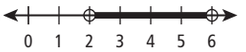

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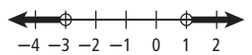

21.

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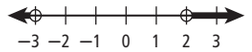
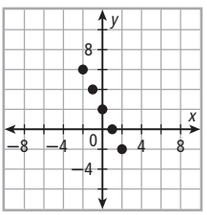
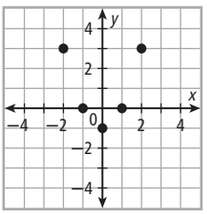
23.



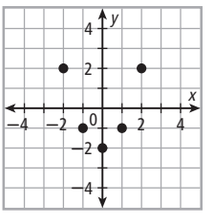
60. $(-2, 6)$, $(-1, 4)$, $(0, 2)$, $(1\ 0)$, $(2, -2)$



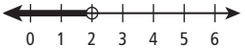
61. $(-2, 3)$, $(-1, 0,)$ $(0, -1)$, $(1, 0)$, $(2, 3)$



62. $(-2, 2)$, $(-1, -1)$, $(0, -2)$, $(1, -1)$, $(2, 2)$

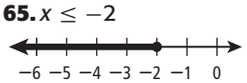


63. $m < 2$



64. $x > -1$

65. $x \leq -2$



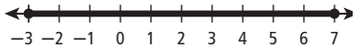
2-7 Exercises

20. $-4 \leq x \leq 4$

21. $2 < x < 4$

Additional Answers

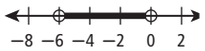
22. $-3 \le x \le 7$



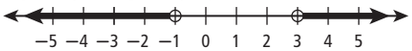
23. $-3 < x < 3$

24. $0 \le x \le 4.8$

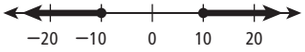
25. $-6 < x < 0$



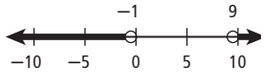
26. $x < -1$ OR $x > 3$



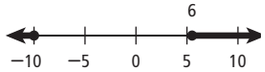
27. $x \le -10$ OR $x \ge 10$



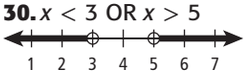
28. $x < -1$ OR $x > 9$



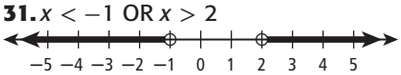
29. $x \le -10$ OR $x \ge 6$



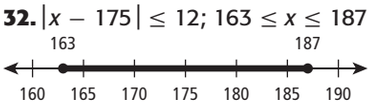
30. $x < 3$ OR $x > 5$



31. $x < -1$ OR $x > 2$



32. $|x - 175| \le 12$; $163 \le x \le 187$



53. $k \le 1$; the inequality is equivalent to $|x| < k - 1$, and this has no solutions when the expression on the right side is less than or equal to 0 (i.e., when $k - 1 \le 0$ or $k \le 1$).

54. The difference between a number and -6 must be less than 5; $|x - (-6)| < 5$; $|x + 6| < 5$

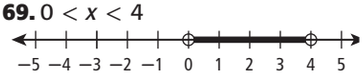
65. all real numbers less than 2

66. all real numbers less than 7

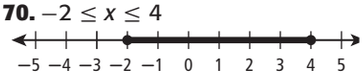
67. all real numbers greater than or equal to −6

68. all real numbers less than or equal to -7

69. $0 < x < 4$



70. $-2 \le x \le 4$

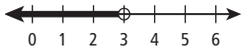


71. $x < 1$ OR $x > 4$

72. $x \le -1$ OR $x \ge 2$

2B *Ready To Go On?*

1.



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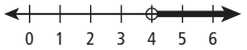

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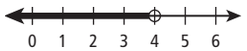

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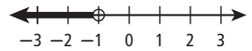
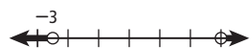


11.

17.

18.

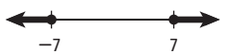


20.

22. $-3 \le x \le 3$

23. $-28 < x < 14$

24. $x \le -7$ OR $x \ge 7$



29.

Extra Practice Skills

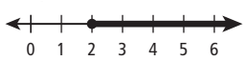
1. all real numbers less than −5

2. all real numbers greater than or equal to 11

3. all real numbers greater than 9

4. all real numbers less than or equal to $\frac{3}{4}$

5.



19.

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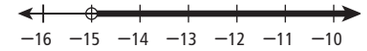

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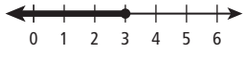

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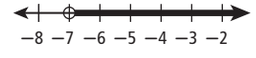
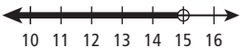


30.

31.

32.



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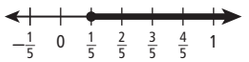

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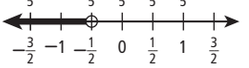

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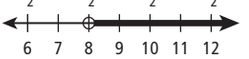

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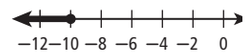

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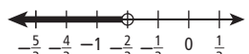

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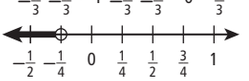

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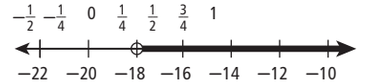

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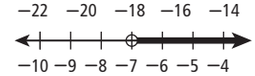

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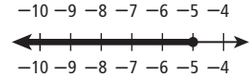

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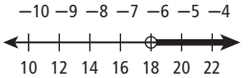

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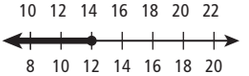

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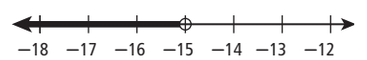

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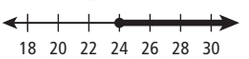

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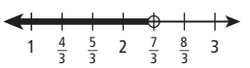

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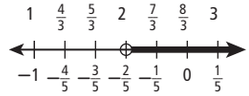

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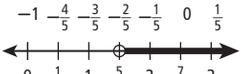

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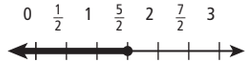

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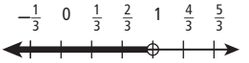

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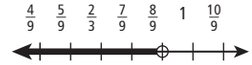

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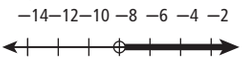

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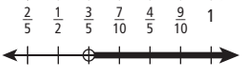

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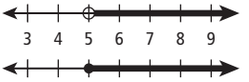

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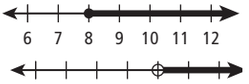
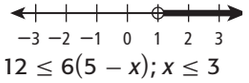


62. $12 \le 6(5 - x)$; $x \le 3$



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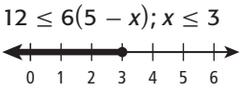
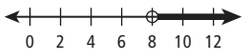


Additional Answers

64.


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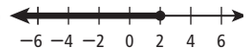

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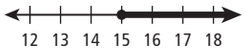

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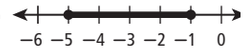

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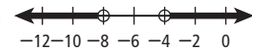

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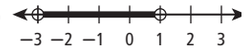
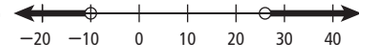
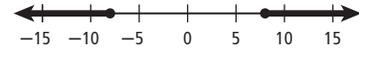


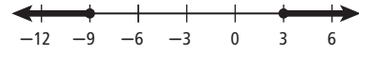
81.

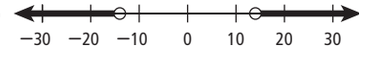
82.

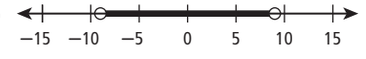
83.

84.


85.


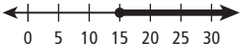
86.


90.


91.


Extra Practice Applications

1. Let x represent the weight of a box in ounces; $x \geq 15$.

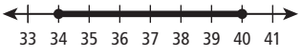


2. Let x be the age of a visitor to the museum; $x < 13$ where x is nonneg.

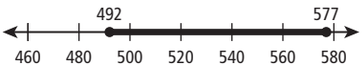
3. $96 + x \leq 102$; 0, 1, 2, 3, 4, 5, or 6 additional customers

4. $63 + x \geq 74$; at least 11 mi/h greater

11. $34 \leq x \leq 40$



12. $492 \leq x \leq 577$

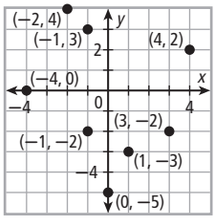


Additional Answers

Chapter 3

Are You Ready?

6–13.



14. $(-2, 3)$, $(-1, 1)$, $(0, -1)$, $(1, -3)$, $(2, -5)$

15. $(-2, -1)$, $(-1, 0)$, $(0, 1)$, $(1, 2)$, $(2, 3)$

16. $(-2, -4)$, $(-1, -1)$, $(0, 0)$, $(1, -1)$, $(2, -4)$

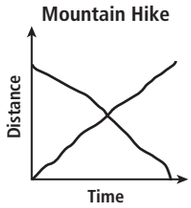
17. $(-2, 1)$, $\left(-1, \frac{3}{2}\right)$, $(0, 2)$, $\left(1, \frac{5}{2}\right)$, $(2, 3)$

18. $(-2, 1)$, $(-1, 0)$, $(0, 1)$, $(1, 4)$, $(2, 9)$

19. $(-2, 9)$, $(-1, 4)$, $(0, 1)$, $(1, 0)$, $(2, 1)$

3-1 *Exercises*

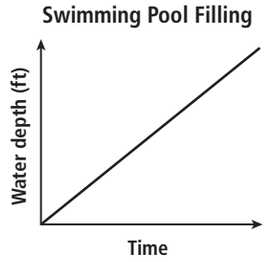
19. The point of intersection represents the time of day when you will be the same distance from the base of the mountain on both the hike up and the hike down.



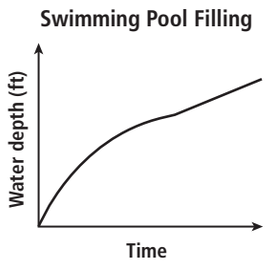
20. Both graphs would start from the origin and then rise. The graph for the brick would increase rapidly and then drop suddenly to zero. The graph for the rolled ball would increase less rapidly and then slowly drop to zero.

21. Possible answer: The number of eggs in stock in a grocery store on different days could be represented by a discrete graph. The depth of a scuba diver during a dive could be represented by a continuous graph.

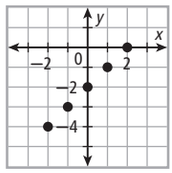
22a.



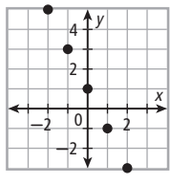
22b.



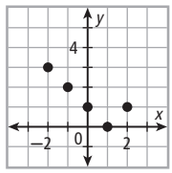
32. $(-2, -4)$, $(-1, -3)$, $(0, -2)$, $(1, -1)$, $(2, 0)$; line



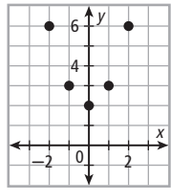
33. $(-2, 5)$, $(-1, 3)$, $(0, 1)$, $(1, -1)$, $(2, -3)$; line



34. $(-2, 3)$, $(-1, 2)$, $(0, 1)$, $(1, 0)$, $(2, 1)$; V-shape



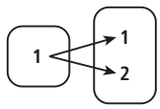
35. $(-2, 6)$, $(-1, 3)$, $(0, 2)$, $(1, 3)$, $(2, 6)$; U-shape

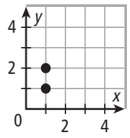


3-2 *Exercises*

3.

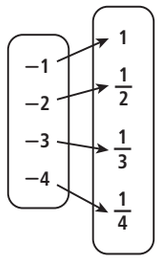
x	y
1	1
1	2

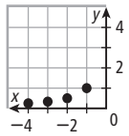




4.

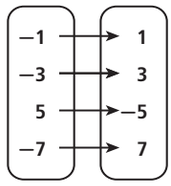
x	y
−1	1
−2	$\frac{1}{2}$
−3	$\frac{1}{3}$
−4	$\frac{1}{4}$

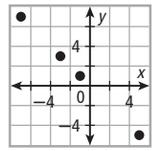




5.

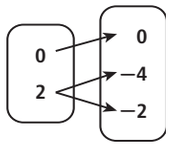
x	y
−7	7
−3	3
−1	1
5	−5

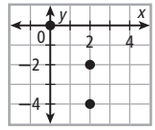




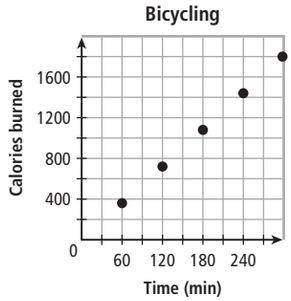
6.

x	y
0	0
2	−4
2	−2





26a. $\{(60, 360), (120, 720), (180, 1080), (240, 1440), (300, 1800)\}$



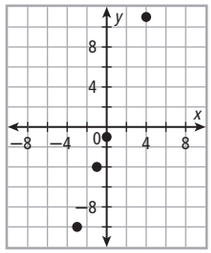
b. D: {60, 120, 180, 240, 300}; R: {360, 720, 1080, 1440, 1800}

c. Yes; each domain value is paired with exactly one range value.

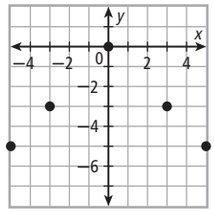
Additional Answers

3-4 *Exercises*

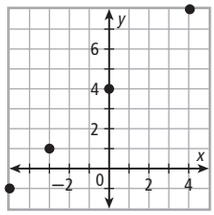
1.



2.



3.



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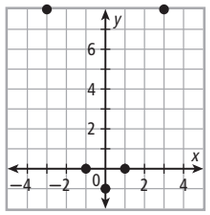
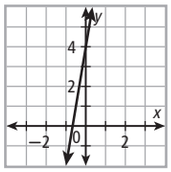


5.



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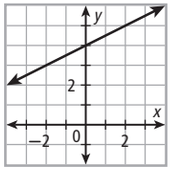

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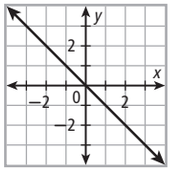

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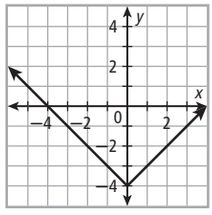

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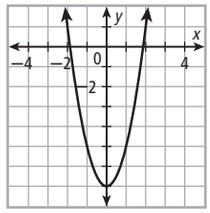
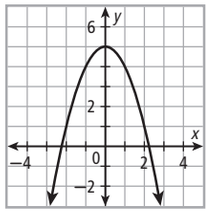
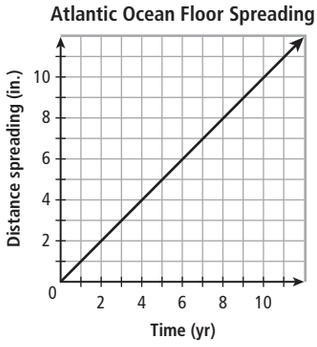


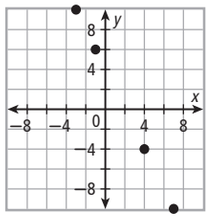
10.



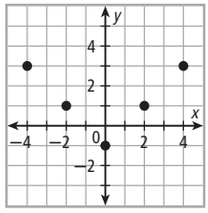
12. about 10.5 in.



13.



14.



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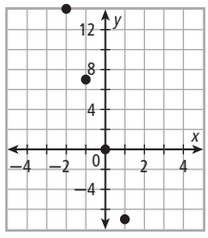

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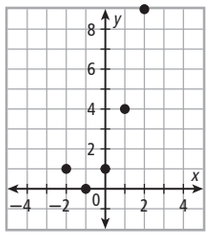

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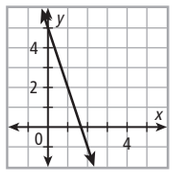

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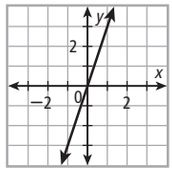

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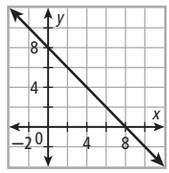

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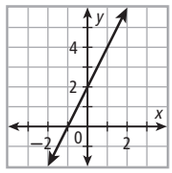

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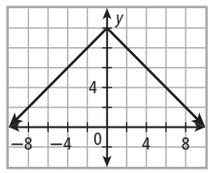

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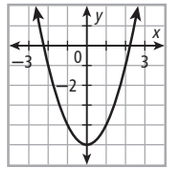

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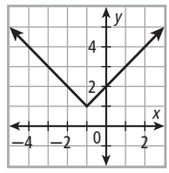

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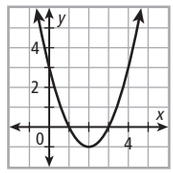

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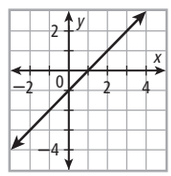
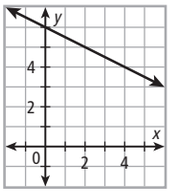
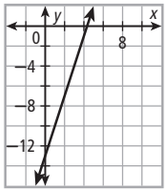


Additional Answers

29.



30.



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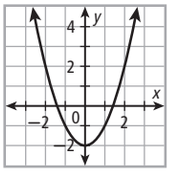

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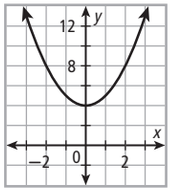

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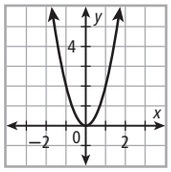

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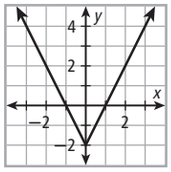

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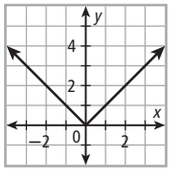

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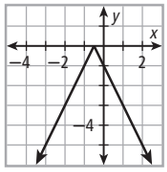
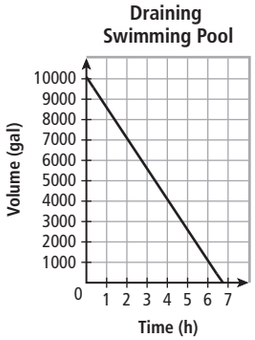


55a. $v = 10{,}000 - 1500h$

b. 8500 gal

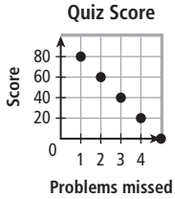
c.

Time (h)	Volume (gal)
0	10,000
1	8,500
2	7,000
3	5,500
4	4,000



3A *Ready to Go On?*

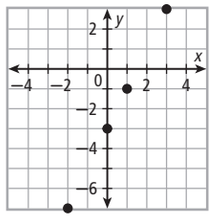
3.



5. D: {−2, 0, 2}; R: {3}; yes; each element in the domain is assigned to exactly 1 element in the range.

6. D: $\{-4 \le x \le 2\}$; R: $\{0 \le y \le 4\}$; yes; each element in the domain is assigned to exactly one element in the range.

13.



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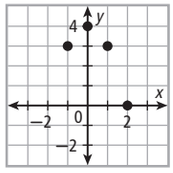

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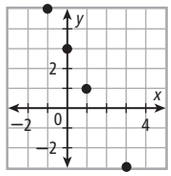

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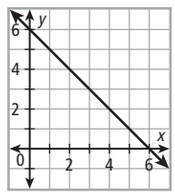

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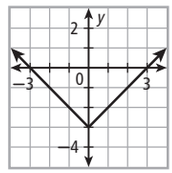

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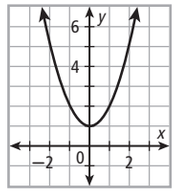
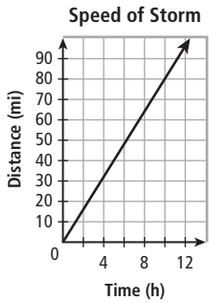
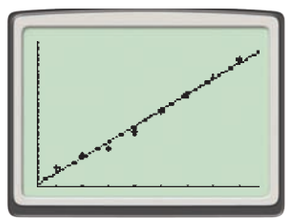


19. Possible answer: about 85 mi



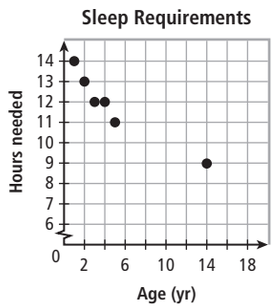
3-5 *Technology Lab*

1.



Chapter 3 Test

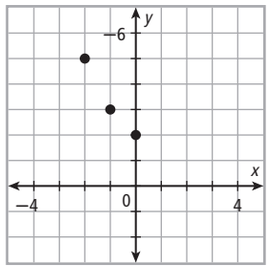
16.



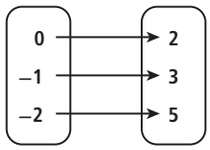
Additional Answers

Extra Practice Skills

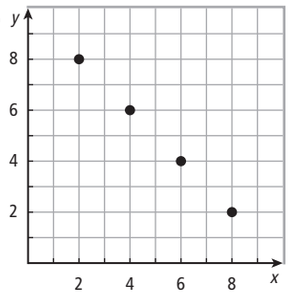
4.



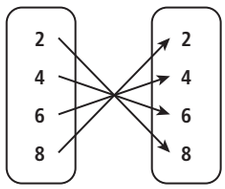
x	y
0	2
−1	3
−2	5



5.



x	y
2	8
4	6
6	4
8	2



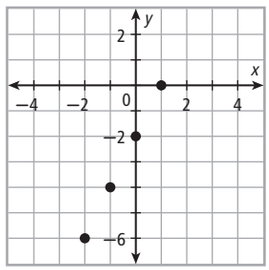
6. D: {−1, 3, 2, 5}; R: {−3, 0, 2, 4}; yes; each domain value is paired with exactly one range value.

7. D: {0, 5}; R: {−3, 1, 2, 4}; no; each domain value does not have exactly one range value.

9. D: {4 ≤ *x* ≤ 8}; R: {2 ≤ *y* ≤ 8}; yes; each domain value is paired with exactly one range value.

11. *y* is *x* squared; $y = x^2$

19.



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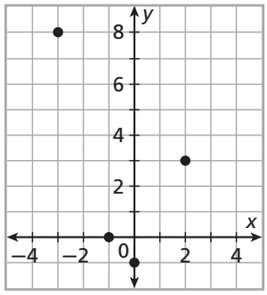

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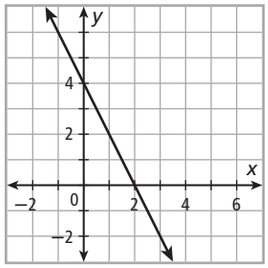

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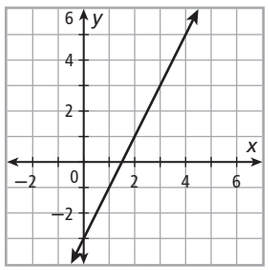

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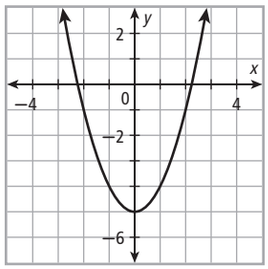


32. As the number of chess pieces captured increases, the number of pieces still on the board decreases.

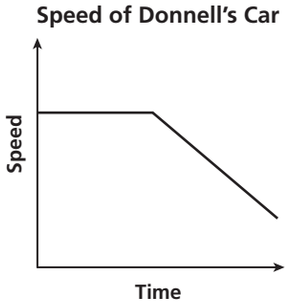
33. A person's height has nothing to do with the color of his or her eyes.

34. There is probably no correlation between the data sets, and graph B shows no correlation.

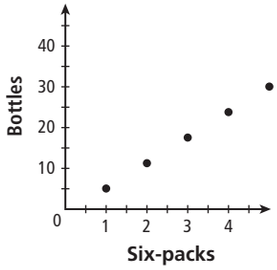
35. There is a negative correlation between the data sets, and graph A shows a negative correlation.

Extra Practice Applications

1. continuous



2. discrete



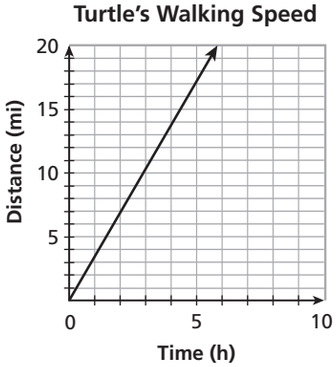
3a.

x	y
20	200
30	190
35	185
40	180

b. Yes; each domain value is paired with exactly one range value.

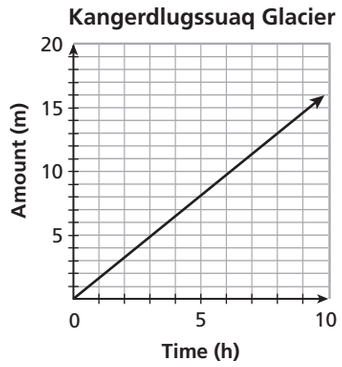
4. No; one of the domain values (93) is paired with more than one range value.

7. 15.75 mi



8. 12.8 m

Additional Answers

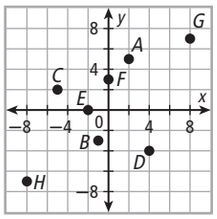


Additional Answers

Chapter 4

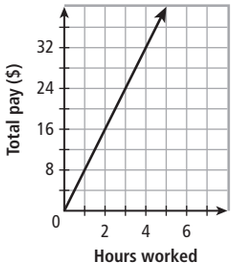
Are You Ready?

5–12.



Reading and Writing Math

1.



Hours Worked	Total Pay ($)
0	0
1	8
2	16
3	24
4	32
5	40

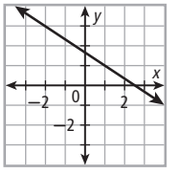
The table shows some ordered-pair solutions to the equation. The graph is a visual representation of all ordered-pair solutions to the equation, including those in the table.

2. Possible answer: An equation is useful when you need a rule to calculate how much money you make for working certain hours. A table is useful if you need a list of pay amounts for various amounts of time worked. A graph is useful to see the relationship between hours worked and total pay.

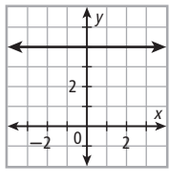
4-1 *Exercises*

8. A constant change of -3 in x corresponds to different changes in y.

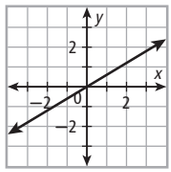
9.



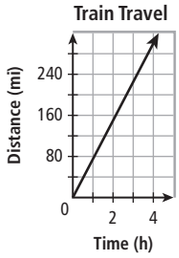
10.



12.

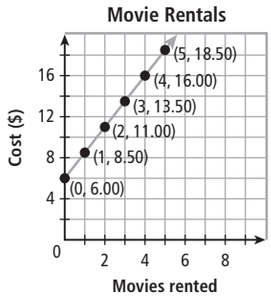


13.



D: $x \geq 0$; R: $y \geq 0$

14.



D: {0, 1, 2, 3, …}

R: {$6.00, $8.50, $11.00, $13.50, …}

15. Each domain value is paired with exactly one range value.

16. Each domain value is paired with exactly one range value.

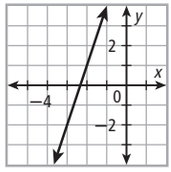
17. Each domain value is paired with exactly one range value.

18. A constant change of $+3$ in x corresponds to different changes in y.

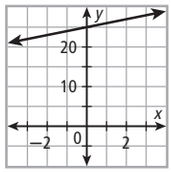
19. A constant change of $+1$ in x corresponds to a constant change of $+1$ in y.

20. A constant change of -3 in x corresponds to a constant change of -2 in y.

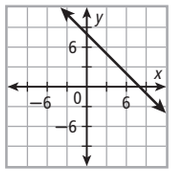
42.



43.



44.



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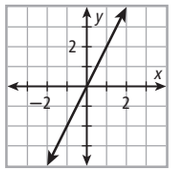

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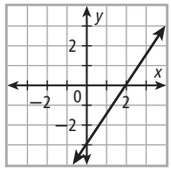

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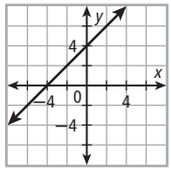
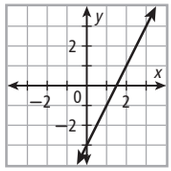


48.



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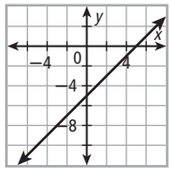
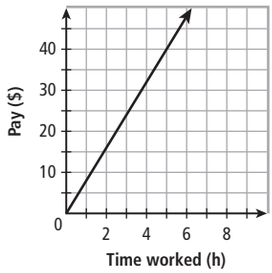


51b.

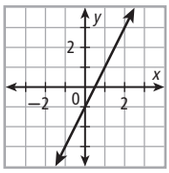


D: $x \geq 0$; R: $y \geq 0$

Additional Answers

52. Possible answer:

x	$y = 2x - 1$
−2	−5
−1	−3
0	−1
1	1
2	3

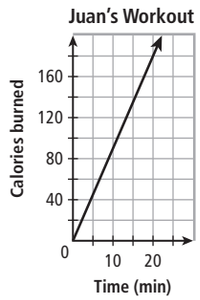


The table gives some ordered pairs (x, y) that satisfy the equation $y = 2x - 1$. The graph is a representation of all ordered pairs (x, y) that satisfy $y = 2x - 1$.

53. Possible answer: The value in cents of x dimes is $y = 10x$. Since you can have only a whole number of dimes, the domain and range are restricted to whole numbers.

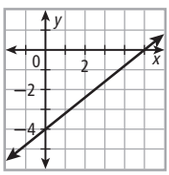
54a. Possible answer: Each constant change in time (+3 minutes) corresponds with a constant change in calories (+27 Calories).

b.

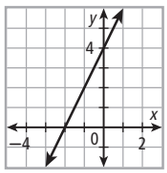


4-2 Exercises

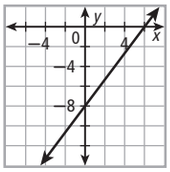
9.



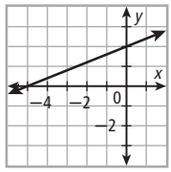
10.



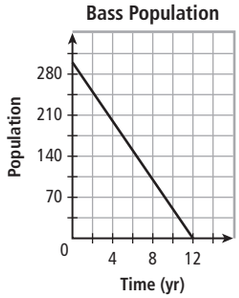
11.



12.

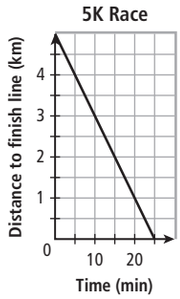


22a.



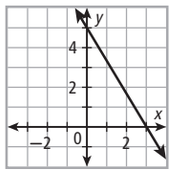
b. x-int.: time when bass pop. is 0; y-int.: number of bass originally put in lake

23a.

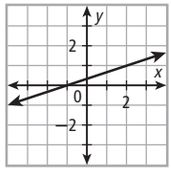


b. x-int.: total time to run race (when dist. to finish line is 0); y-int.: total length of race (when time is 0)

28.

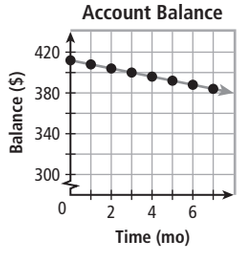


29.



31b. The x-intercept represents the year 2400 and the y-intercept represents 7.5 million acres.

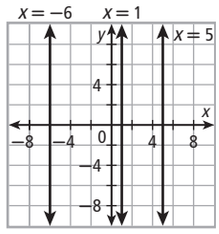
32a.



D: {0, 1, 2, 3, …};

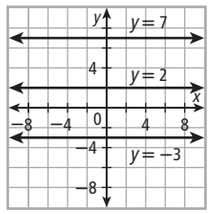
R: {$412, $408, $404, $400, …}

33a.



$x = -6$: x-int.: −6, no y-int.; $x = 1$: x-int.: 1, no y-int.; $x = 5$: x-int.: 5, no y-int.

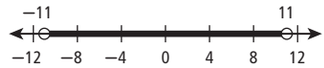
b.



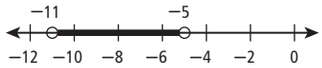
$y = -3$: no x-int., y-int.: −3; $y = 2$: no x-int., y-int.: 2; $y = 7$: no x-int., y-int.: 7

4-4 Exercises

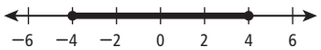
38. $-11 < x < 11$



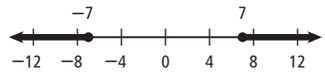
39. $-11 < x < -5$



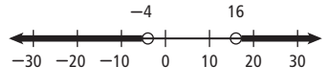
40. $-4 \leq x \leq 4$



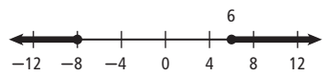
41. $x \leq -7$ OR $x \geq 7$



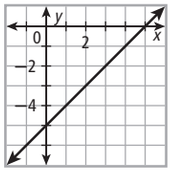
42. $x < -4$ OR $x > 16$



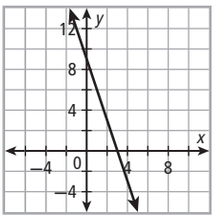
43. $x \leq -8$ OR $x \geq 6$



46.

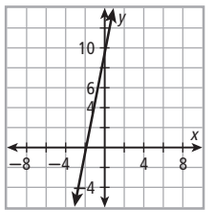


47.



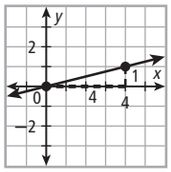
Additional Answers

48.



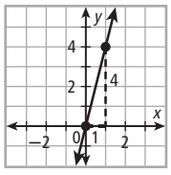
4-5 *Exercises*

22. $y = \frac{1}{4}x$



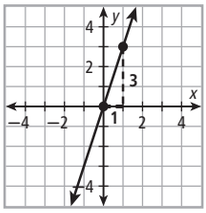
$k = \frac{1}{4}$; graph shows slope $= \frac{1}{4}$

23. $y = 4x$



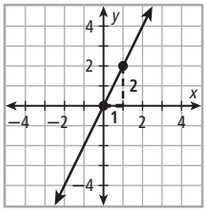
$k = 4$; graph shows slope $= 4$

24. $y = 3x$



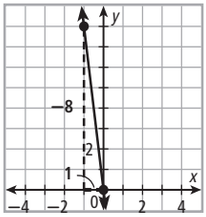
$k = 3$; graph shows slope $= 3$

25. $y = 2x$



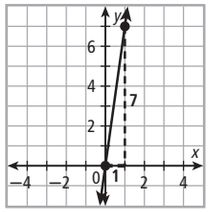
$k = 2$; graph shows slope $= 2$

26. $y = -8x$



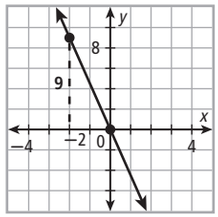
$k = -8$; graph shows slope $= -8$

27. $y = 7x$



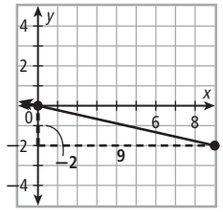
$k = 7$; graph shows slope $= 7$

28. $y = -\frac{9}{2}x$



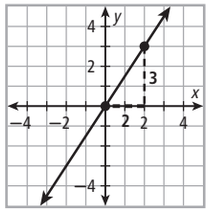
$k = -\frac{9}{2}$; graph shows slope $= -\frac{9}{2}$

29. $y = -\frac{2}{9}x$



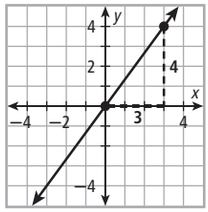
$k = -\frac{2}{9}$; graph shows slope $= -\frac{2}{9}$

30. $y = \frac{3}{2}x$



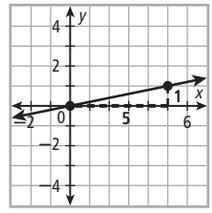
$k = \frac{3}{2}$; graph shows slope $= \frac{3}{2}$

31. $y = \frac{4}{3}x$



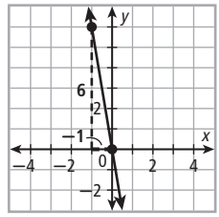
$k = \frac{4}{3}$; graph shows slope $= \frac{4}{3}$

32. $y = \frac{1}{5}x$



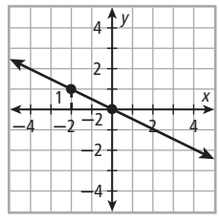
$k = \frac{1}{5}$; graph shows slope $= \frac{1}{5}$

33. $y = -6x$



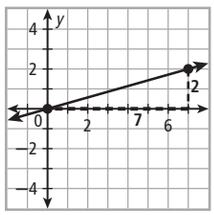
$k = -6$; graph shows slope $= -6$

34. $y = -\frac{1}{2}x$



$k = \frac{1}{2}$; graph shows slope $= \frac{1}{2}$

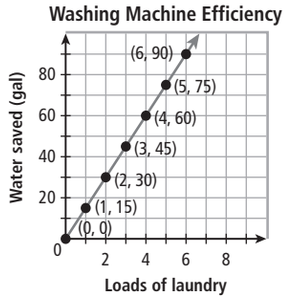
35. $y = \frac{2}{7}x$



$k = \frac{2}{7}$; graph shows slope $= \frac{2}{7}$

37b.

Additional Answers



No; Mischa cannot wash a fraction of a load, so only pts. whose *x*-coord. is a whole number make sense.

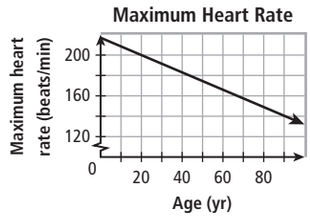
38. Yes; since $\frac{y}{x}$ is the same for all ord. pairs, $2x$ must correspond to $2y$.

4A Multi-Step Test Prep

1.

Age (yr)	Maximum Heart Rate (beats/min)
13	205.95
14	205.1
15	204.25
16	203.4
17	202.55
18	201.7

2. *x*-int.: ≈ 255.29; *y*-int.: 217; slope: −0.85



3. *x*-int.: the (hypothetical) age at which someone's max. heart rate would be 0 beats/min; *y*-int.: max. heart rate of someone who is 0 years old

4. slope: how much the max. heart rate decreases for each year that someone ages; because as age increases, max. heart rate decreases

5. The absolute value of the slope is less, so the line is less steep. The *y*-intercept is less, so the line crosses the *y*-axis at a lower point.

7. min.:

$m = 0.7(217 - 0.85a)$

$= 151.9 - 0.595a$

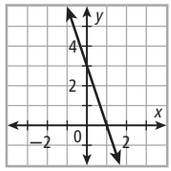
max.:

$m = 0.8(217 - 0.85a)$

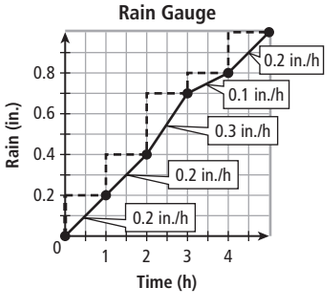
$= 173.6 - 0.68a$

4A Ready to Go On?

5.

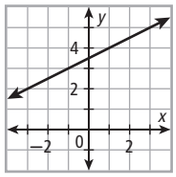


6.

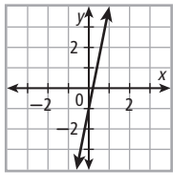


4-6 Exercises

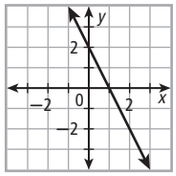
2.



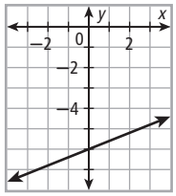
3.



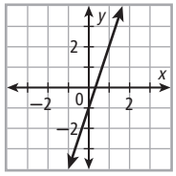
4.



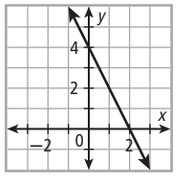
10.



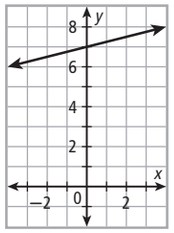
11.



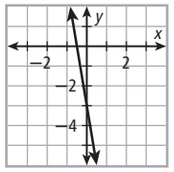
12.



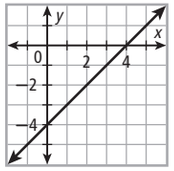
14.



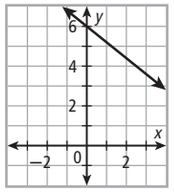
15.



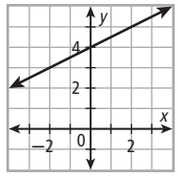
16.



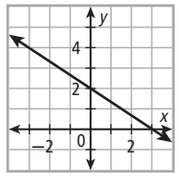
17.



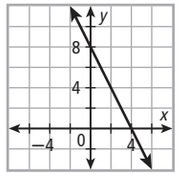
23. $y = \frac{1}{2}x + 4$



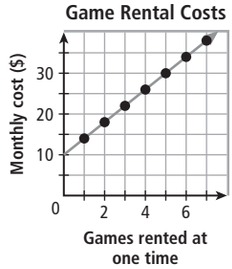
24. $y = -\frac{2}{3}x + 2$



25. $y = -2x + 8$



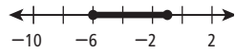
27a.



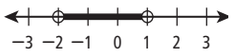
Additional Answers

4-7 Exercises

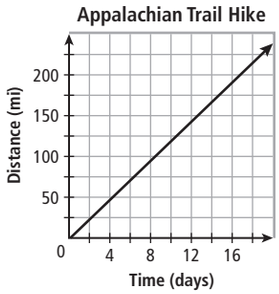
59.



60.



61.

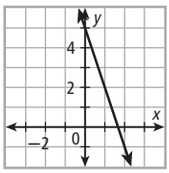


Possible answer: 216 mi

4-9 Exercises

55. If the line containing A and B has the same slope as the line containing B and C, then either $\overleftrightarrow{AB}$ is par. to $\overleftrightarrow{BC}$ or they are the same line. They cannot be par. because they both contain B. Therefore they must be the same line.

60.



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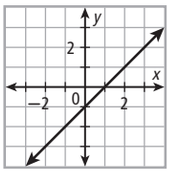
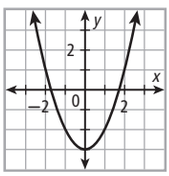
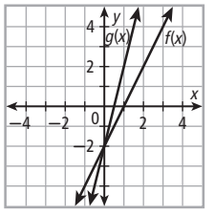


62.



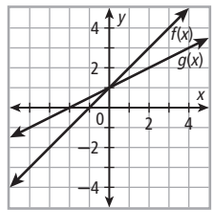
4-10 Exercises

9.



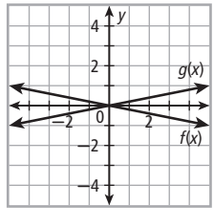
rot. about (0, −2) (steeper)

10.

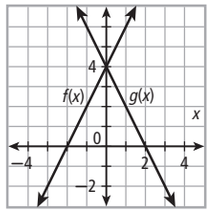


rot. about (0, 1) (less steep)

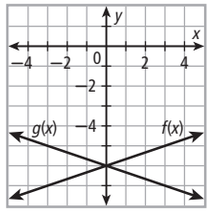
11.



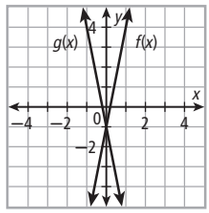
12.



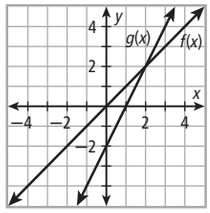
13.



14.

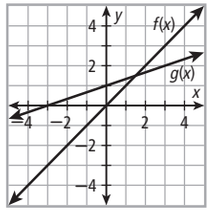


15.



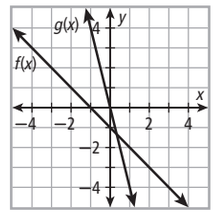
rot. about (0, 0) (steeper) and trans. 2 units down

16.



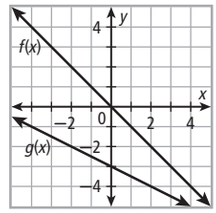
rot. about (0, 0) (less steep) and trans. 1 unit up

17.



rot. about (0, 0) (steeper) and trans. 1 unit up

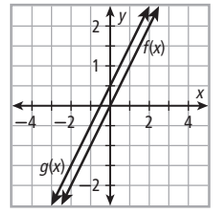
18.



rot. about (0, 0) (less steep) and trans. 3 units down

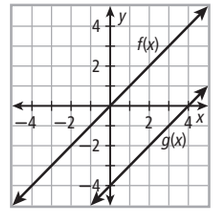
19. translated 25 units up; rotated about (0, 25) (less steep)

20.



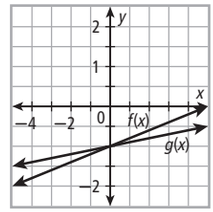
trans. $\frac{1}{2}$ unit up

21.



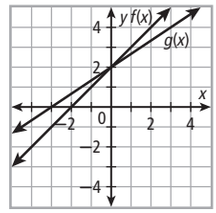
trans. 4 units down

22.



rot. about (0, −1) (less steep)

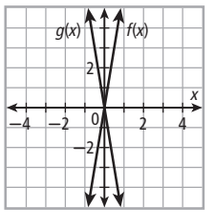
23.



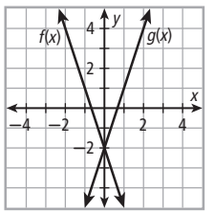
rot. about (0, 2) (less steep)

Additional Answers

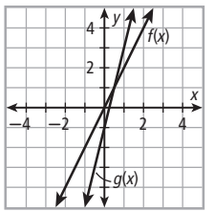
24.



25.

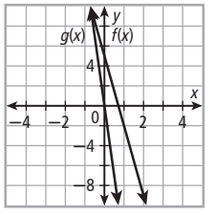


26.



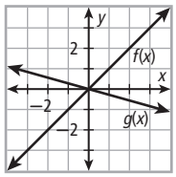
rot. about (0, 0) (steeper) and trans. 1 unit down

27.



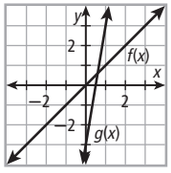
rot. about (0, 0) (steeper) and trans. 5 units down

32. rot. about (0, 0) (less steep)



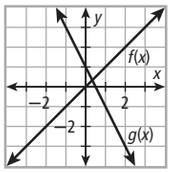
diff. slopes; same *y*-int.

33. rot. about (0, 0) (steeper) and trans. 3 units down



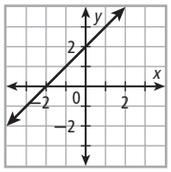
diff. slopes, diff. *y*-intercepts.

34. rot. about (0, 0) (steeper) and trans. 1 unit up



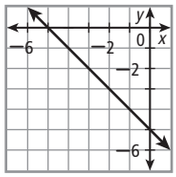
diff. slopes, diff. *y*-intercepts.

35. Possible answer:

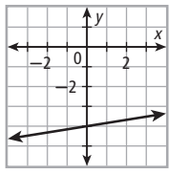


(Answers may vary depending on the point of rotation used.)

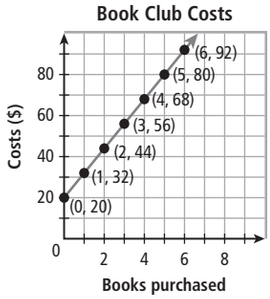
36.



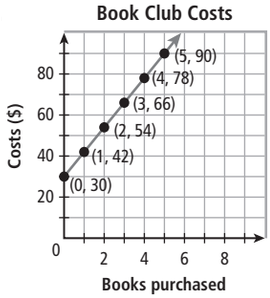
37.



38a.



38b.



c. The graph in part **a** is translated 10 units up to get the graph in part **b.**

39. trans. 9 units down

40. ref. across *y*-axis; rot. about (0, 0)

41. rot. about (0, 0) (steeper)

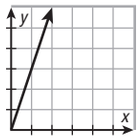
42. rot. about (0, 1) (less steep), and trans. 1 unit up

43. rot. about (0, 0) (steeper)

44. rot. about (0, 0) (less steep)

47. Possible answer: A reflection across the *y*-axis multiplies the *x*-coordinate of each ordered pair by −1. For example, when $f(x) = x$ is reflected across the *y*-axis, the *x*-coordinate changes to $-x$. $\big($i.e., $(1, 0) \rightarrow (-1, 0)\big)$

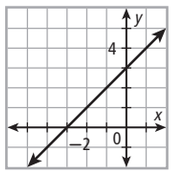
48a. $y = 3x$



b. Possible answer: Jen is walking from the stadium to the softball field, and the stadium is 100 ft closer to the field than the school is.

c. the dist. from the school when the walk begins

51.



58. $y = -2x + 3$ and $y = -2x - 4$

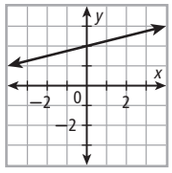
59. $y = -\frac{3}{5}x$ and $y + 1 = -\frac{3}{5}(x - 2)$

60. $3x - 5y = 5$ and $5x + 3y = -21$; $5y = -2x - 15$ and $y = \frac{5}{2}x - 2$

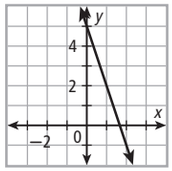
61. $x = 4$ and $y = -3$; $2y + x = 6$ and $y = 2x + 3$

4B *Ready to Go On?*

1.

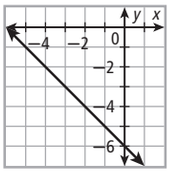


2.

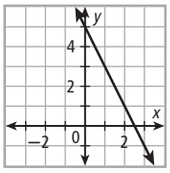


Additional Answers

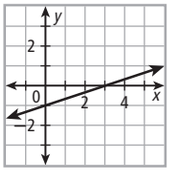
3.



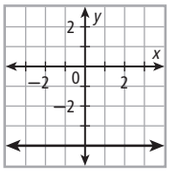
4.



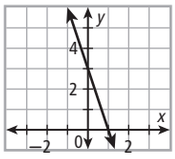
5.



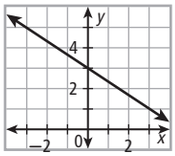
6.



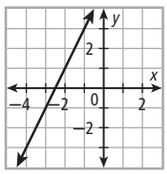
8.



9.



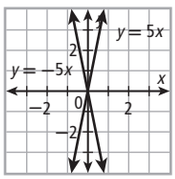
10.



16. $y = -4x - 1$ and $y = \frac{1}{4}x$

17. $y = -\frac{3}{4}x$ and $y = \frac{4}{3}x$; $y = 4$ and $x = 3$

20.



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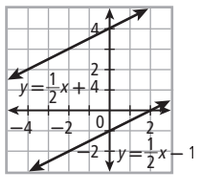
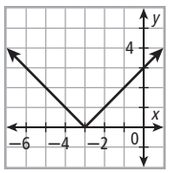
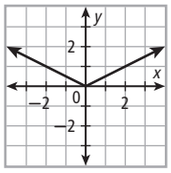


Extension *Exercises*

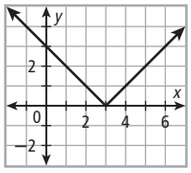
2. axis of symmetry: $x = -3$; vertex: $(-3, 0)$; x-int.: -3; y-int.: 3; D: all real numbers; R: $y \geq 0$; left slope: -1; right slope: 1; minimum: 0



3. axis of symmetry: $x = 0$; vertex: $(0, 0)$; x-int.: 0; y-int.: 0; D: all real numbers; R: $y \geq 0$; left slope: $-\frac{1}{2}$; right slope: $\frac{1}{2}$; minimum: 0

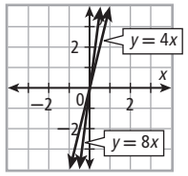


4. axis of symmetry: $x = 3$; vertex: $(3, 0)$; x-int.: 3; y-int.: 3; D: all real numbers; R: $y \geq 0$; left slope: -1; right slope: 1; minimum: 0

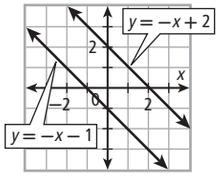


Chapter 4 Test

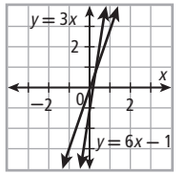
18. rot. about (0, 0) (less steep)



19. trans. 3 units down



20. rot. about (0, 0) (steeper) and trans. 1 unit down



Extra Practice Skills

1. Yes; each domain value is paired with exactly one range value; yes

2. Yes; each domain value is paired with exactly one range value; yes

3. Yes; each domain value is paired with exactly one range value; no

4. Yes; a constant change of $+2$ in x corresponds to a constant change of -1 in y.

5. No; a constant change of $+3$ in x corresponds to different changes in y.

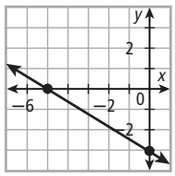
6. yes; $3x + y = 8$; $A = 3$; $B = 1$; $C = 8$

7. yes; $\frac{1}{3}x + 2y = 4$; $A = \frac{1}{3}$; $B = 2$; $C = 4$

9. yes; $4x + 3y = -3$; $A = 4$; $B = 3$; $C = -3$

10. x-int.: $\frac{1}{4}$; y-int.: $\frac{1}{2}$

14.



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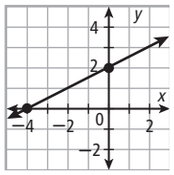

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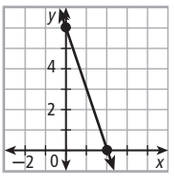

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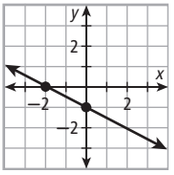

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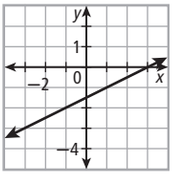

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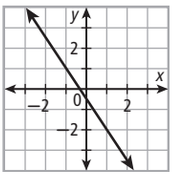
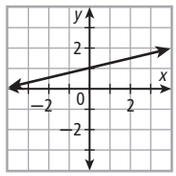


Additional Answers

44.



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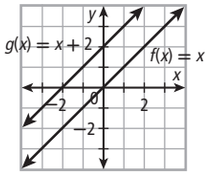

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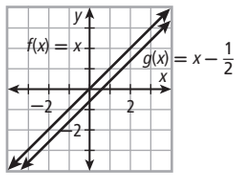

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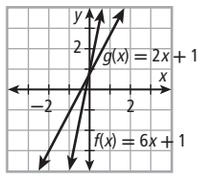
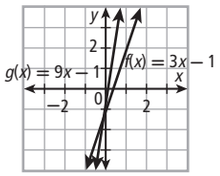


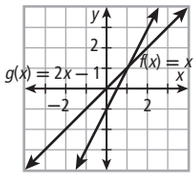
rot. about $(0, 1)$ (less steep)

61.

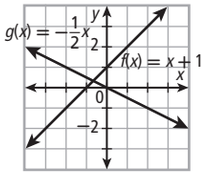


rot. about $(0, -1)$

62.



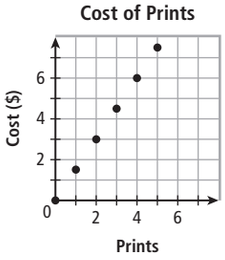
63.



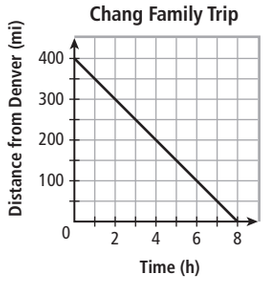
rot. and trans. 1 unit down

Extra Practice Applications

1. D: {0, 1, 2, 3, ...}; R: {\$0, \$1.50, \$3.00, \$4.50, ...}



2a.

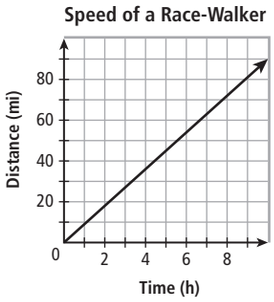


b. *y*-int.: 400; starting distance from Denver. *x*-int.: 8; time required to reach Denver (8 hours)

3. 1945 to 1950: 1.8 nations/yr; 1950 to 1960: 3.9 nations/yr; 1960 to 1975: 3 nations/yr; from 1950 to 1960

4. −4; the oven cools at a rate of 4 °F per minute.

7. $y = 9x$



8b. *y*-int.: 10; initial rental fee; slope: 1.5; cost per mile.

10. slope of $\overline{AB}$ = slope of $\overline{DC} = -2$; slope of $\overline{AD}$ = slope of $\overline{BC} = \frac{1}{2}$. Therefore, $\overline{AB}$ and $\overline{BC}$ are perp., $\overline{BC}$ and $\overline{DC}$ are perp., $\overline{DC}$ and $\overline{AD}$ are perp., and $\overline{AD}$ and $\overline{AB}$ are perp., the figure has four right angles and is a rectangle.

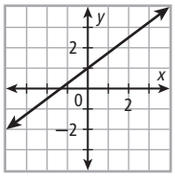
11. trans. 2 units up; rot. about $(0, 12.50)$(steeper)

Additional Answers

Chapter 5

Are You Ready?

6.



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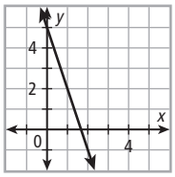

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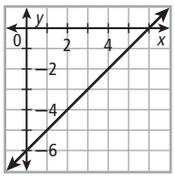

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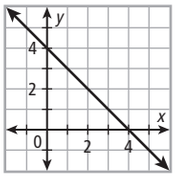

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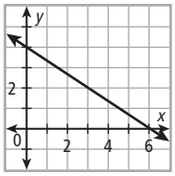

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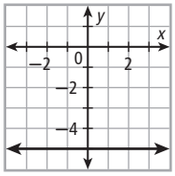

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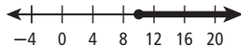

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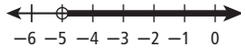
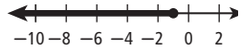


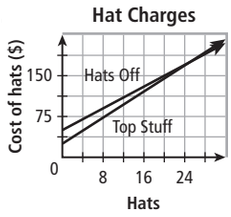
32.



33.

5-1 Exercises

18b.



5-3 Exercises

28. $\left(-\frac{1}{2}, 2\right)$; possible answer: graphing; both equations are in slope-int. form.

29. $\left(\frac{15}{7}, \frac{9}{7}\right)$; possible answer: elimination; when the first equation is multiplied by -2 the x-coefficients are opposites.

6-4 Exercises

12. Possible answer: Substitute $2x - 2$ for y in the second equation.

$$-2x + (2x - 2) = 1$$
$$-2 = 1 \quad ✗$$

13. Possible answer: Substitute $-x - 1$ for y in the first equation.

$$x + (-x - 1) = 3$$
$$-1 = 3 \quad ✗$$

14. Possible answer: Substitute $-\frac{1}{2}x - 4$ for y in the first equation.

$$x + 2\left(-\frac{1}{2}x - 4\right) = -4$$
$$x + (-x) - 8 = -4$$
$$-8 = -4 \quad ✗$$

15. Possible answer: Compare slopes and intercepts.

$$-6 + y = 2x \rightarrow y = 2x - 6$$
$$y = 2x - 36$$

The lines have the same slope and different y-intercepts. Therefore the lines are parallel.

16. Possible answer: Substitute $-2x + 3$ for y in the second equation.

$$2x + (-2x + 3) - 3 = 0$$
$$0 = 0 \quad ✗$$

17. Possible answer: Substitute $x - 2$ for y in the second equation.

$$x - (x - 2) - 2 = 0$$
$$2 - 2 = 0$$
$$0 = 0 \quad ✗$$

18. Possible answer: Substitute $-x - 4$ for y in the first equation.

$$x + (-x - 4) = -4$$
$$-4 = -4 \quad ✗$$

19. Possible answer: Compare slopes and intercepts.

$$-9x - 3y = -18 \rightarrow$$
$$y = -3x + 6$$
$$3x + y = 6 \rightarrow$$
$$y = -3x + 6$$

The lines have the same slope and the same y-intercept. Therefore the graphs are one line.

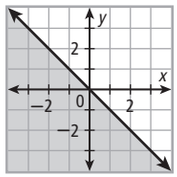
30a. $c = 50 + 1.1b$; $c = 40 + 1.1b$

b. Never; the slope, or cost of the buttons, is the same, and the initial costs, or y-intercepts, are different.

c. For the same price, the y-intercept would have to be changed to 40. Possible answers: The y-intercept may be lowered to a value less than 40, or the slope may be changed to a value less than 1.1.

5-5 Exercises

5.



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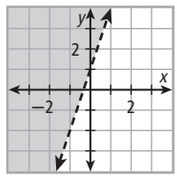

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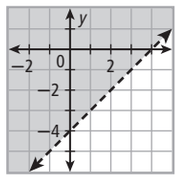

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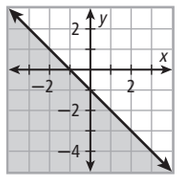

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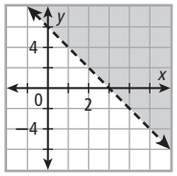
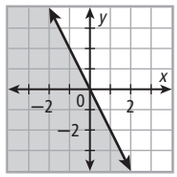


Additional Answers

16.



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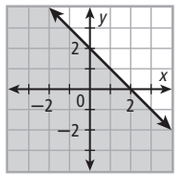

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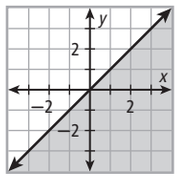
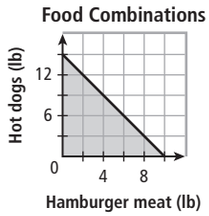


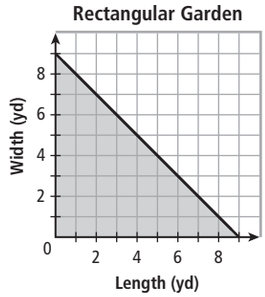
19a. $3x + 2y \leq 30$

b.

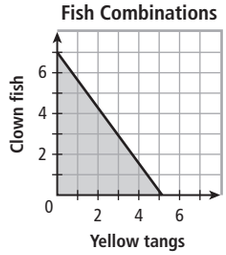


c. Possible answer: (3 lb hamburger, 2 lb hot dogs), (5 lb hamburger, 6 lb hot dogs)

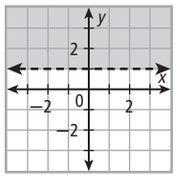
27b. Possible answer: (length: 3 yd, width: 1 yd), (length: 1 yd, width: 6 yd), (length: 6 yd, width: 2 yd)



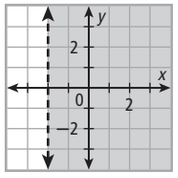
28. $15x + 11y \leq 77$; possible answer: (2, 2.5); you cannot buy half a fish.



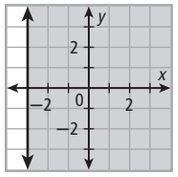
29.



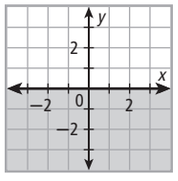
30.



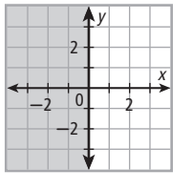
31.



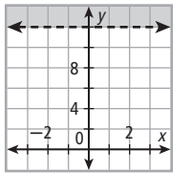
32.



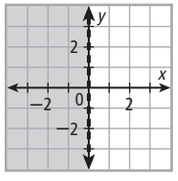
33.



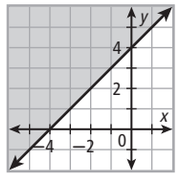
34.



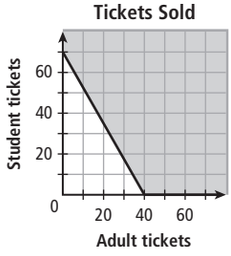
35.



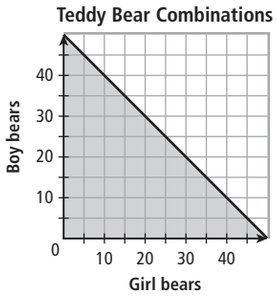
36.



37. $7a + 4s \geq 280$; possible answer: (40, 10), (40, 20), (20, 100)

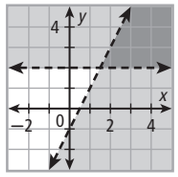


40b.



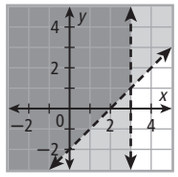
5-6 *Exercises*

5.



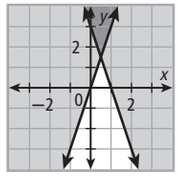
Possible answer: solutions: (3, 3), (4, 3); not solutions: (0, 0), (2, 1)

6.



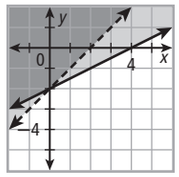
Possible answer: solutions: (0, 0), (1, 1); not solutions: (2, −1), (3, 1)

7.



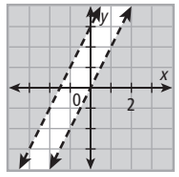
Possible answer: solutions: (0, 4), (1, 4); not solutions: (2, −1), (3, 1)

8.



Possible answer: solutions: (0, 0), (1, 1); not solutions: (3, 0), (−3, −4)

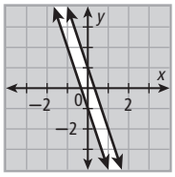
9.



no solutions

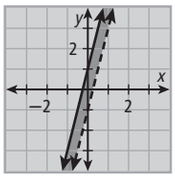
Additional Answers

10.



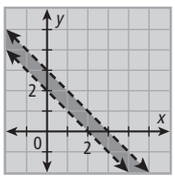
no solutions

11.



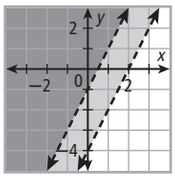
all pts. between the par. lines and on the solid line

12.



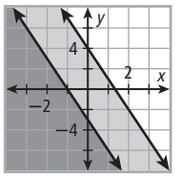
all pts. between the par. lines

13.



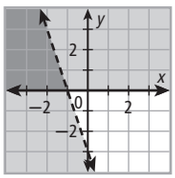
same solutions as $y > 2x - 1$

14.



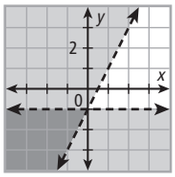
same solutions as $y \leq -3x - 3$

19.



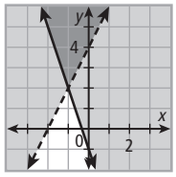
Possible answer: solutions: $(-2, 0)$, $(-3, 1)$;
not solutions: $(0, 0)$, $(1, 4)$

20.



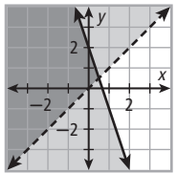
Possible answer:
solutions: $(-2, -2)$, $(-3, -2)$; not solutions: $(0, 0)$, $(1, -4)$

21.



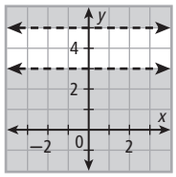
Possible answer: solutions: $(-1, 3)$, $(0, 5)$; not solutions: $(0, 0)$, $(1, 4)$

22.



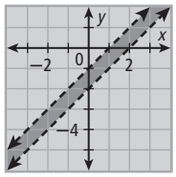
Possible answer: solutions: $(-2, 0)$, $(-3, 1)$; not solutions: $(0, 0)$, $(1, 4)$

23.



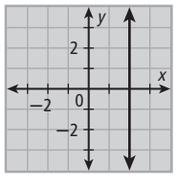
no solutions

24.



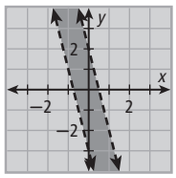
all pts. between the par. lines

25.



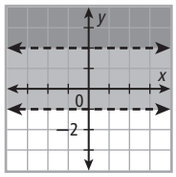
All pts. are solutions.

26.



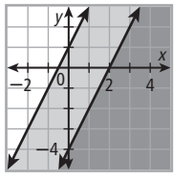
all pts. between the par. lines

27.



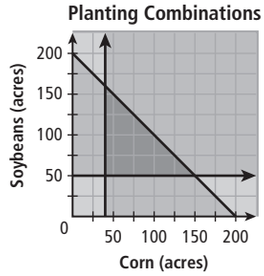
same solutions as $y > 2$

28.



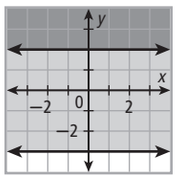
same solutions as $y \leq 2x - 4$

30.

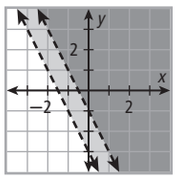


Reasonable solutions are positive rational numbers; possible answer: $(60, 80)$, $(100, 60)$

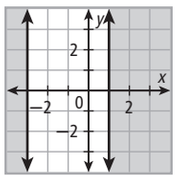
31.



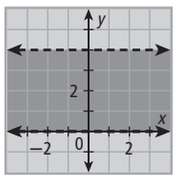
32.



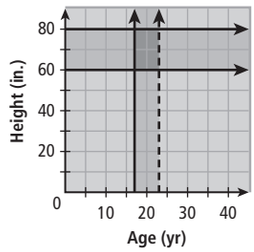
33.



34.

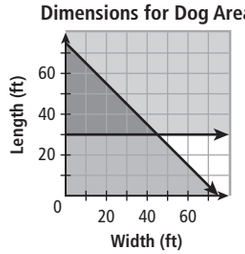


38.



Possible answer: (20, 70), (19, 75), (18, 69)

40.



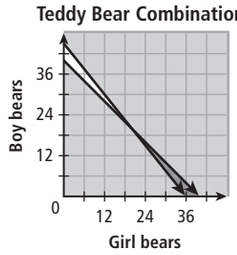
Additional Answers

41. Yes; the solutions of the system $\begin{cases} y \geq x + 4 \\ y \leq x + 4 \end{cases}$ are represented by all the ordered pairs on the line $y = x + 4$.

42a. $x + y \leq 40$

b. $15x + 12y \geq 540$

c.



5-6 *Technology Lab*

1–3. Possible answers given.

1. (0, 0), (1, −1)

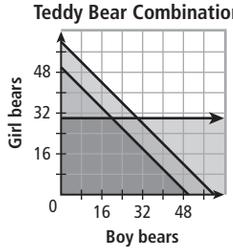
2. (0, 0), (1, 0)

3. (0, 0), (−2, 2)

4. no solution

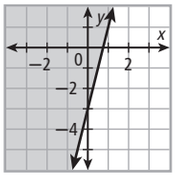
5B *Multi-Step Test Prep*

2.

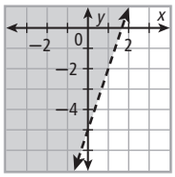


5B *Ready to Go On?*

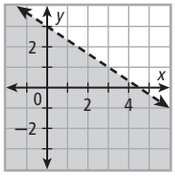
4.



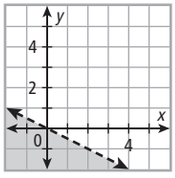
5.



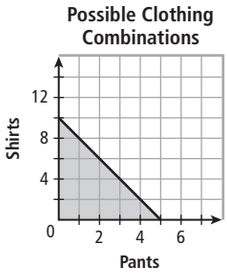
6.



7.

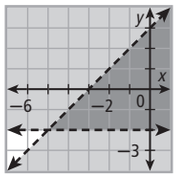


8. $30x + 15y \leq 150$

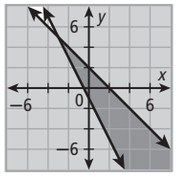


Possible answer: (4, 2), (3, 2), (2, 6)

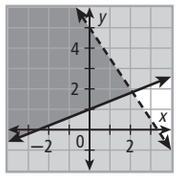
15. Possible answer: solutions: (0, 0), (2, 2); not solutions: (−6, 0), (−4, 4)



16. Possible answer: solutions: (2, 0), (2, −2); not solutions: (6, 0), (−4, 0)



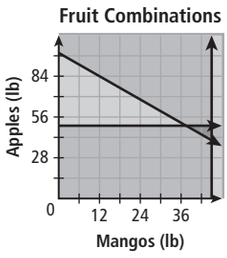
17. Possible answer: solutions: (−6, 6), (−5, 0); not solutions: (2, 0), (4, 8)



21. Let x = pounds of mangos, and y = pounds of apples.

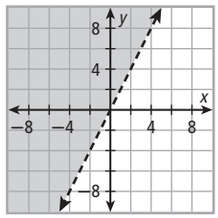
$\begin{cases} x \leq 45 \\ y \leq 50 \\ 4x + 3y \geq 300 \end{cases}$;

possible answer: (45, 40), (42, 50)

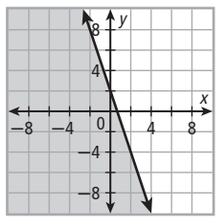


Extra Practice Skills

39.



40.



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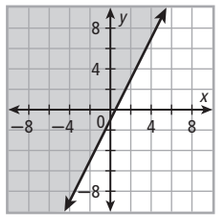
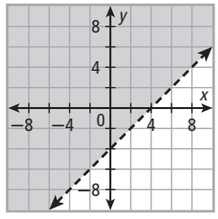


42.



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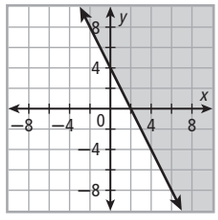

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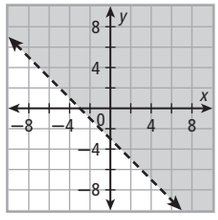
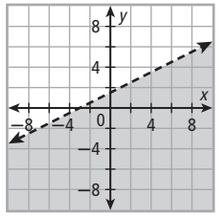
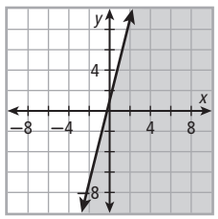


45.



Additional Answers

46.



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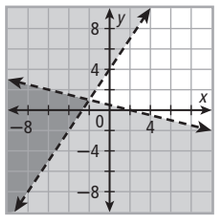
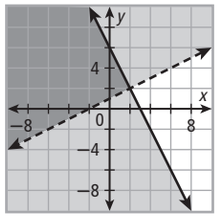


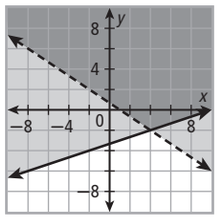
Possible answer: solutions: (−10, 0) and (−12, 1); not solutions: (0, 0) and (6, −2)

53.



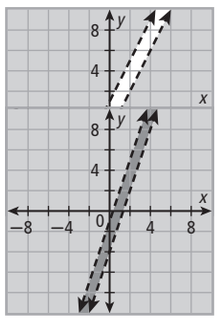
Possible answer: solutions: (−2, 6) and (0, 2); not solutions: (8, 0) and (0, 8)

54.



Possible answer: solutions: (4, 0) and (2, 2); not solutions: (−2, 0) and (6, −6)

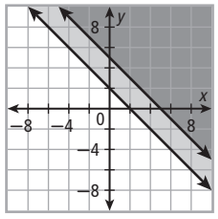
55.



no solution

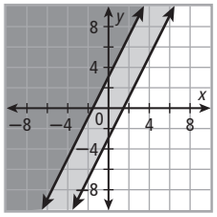
56. all pts. between the par. lines

57.



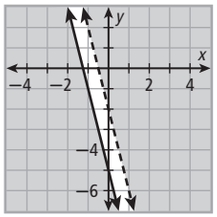
same as solutions of $y \geq -x + 5$

58.



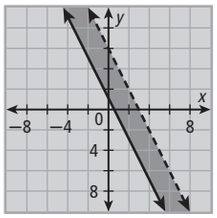
same as solutions of $y \geq 2x + 3$

59.



no solutions

60.



all pts. between the par. lines and on the solid line

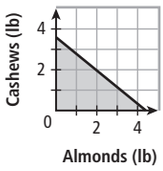
Extra Practice Applications

4. The company with the $200 setup fee is cheaper if more than 14 jerseys are purchased.

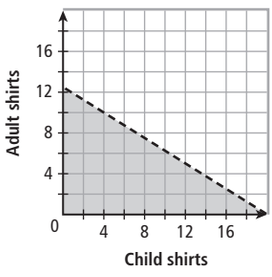
9. No; the graphs are two parallel lines.

10. Yes; the graphs have different slopes, so they intersect.

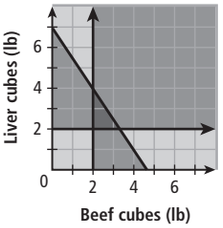
11. $4x + 5y \leq 18$, where x is the number of pounds of almonds and y is the number of pounds of cashews. Possible combinations: (2, 2), (3, 1)



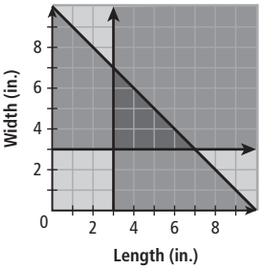
12. $5x + 8y < 100$, where x is the number of child shirts and y is the number of adult shirts. Possible combinations: (16, 2), (8, 6)



13. Possible combinations: 3 lb beef, 2 lb liver; 2 lb beef, 3 lb liver



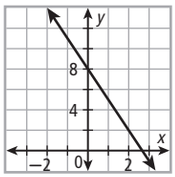
14. Possible combinations: length: 5 in., width: 5 in.; length: 6 in., width: 4 in.

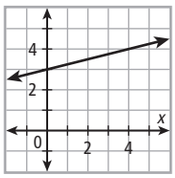


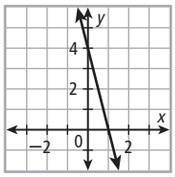
Additional Answers

Chapter 6

6-4 Exercises

66. 

67. 

68. 

6-5 Exercises

49. $10x^2 - x - 2$

50. $x^2 - 3x + 2$

51. $7x^2 - 52x - 32$

52. $6x^2 + 35x + 49$

53. $x^3 - x^2 - x + 10$

54. $2x^3 - 3x^2 - 14x + 15$

55. $-10x^4 + 2x^3 + 20x^2 - 19x + 3$

56. $x^3 - 8x^2 + 21x - 18$

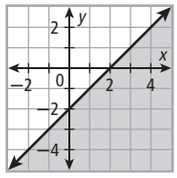
57. $8x^5 - 2x^4 - 12x^3 + 17x^2 - 21$

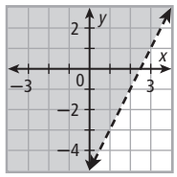
58. $x^3 - 12x^2 + 48x - 64$

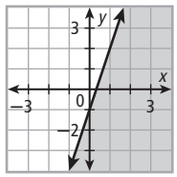
59. $x^3 - 3x - 2$

60. $12x^4 + 60x^3 - 2x^2 - 2x + 40$

61. $-x^3 + 3x^2 - 3x + 1$

102. 

103. 

104. 

6B Ready To Go On?

7. cubic trinomial

8. quadratic monomial

9. quartic polynomial

10. quadratic trinomial

11. 7th-degree polynomial

12. quartic polynomial

14. $10m^3 + 11m^2 + 3m$

15. $12t^2 + 2t - 6$

16. $12d^6 + 2d^4 - 3d^2 + 1$

17. $6y^3 + 2y^2 - 3y$

18. $2n^2 - 8n$

19. $5b^3 + b^2 - 4b - 10$

21. $10h^8$

22. $-6s^9t^7$

23. $10a^4b + 6a^3b^2$

24. $9k^2 + 30k + 25$

25. $8x^5 + 2x^3y + 12x^2y + 3y^2$

26. $9p^4 + 21p^3 - 23p^2 - 15p$

28. $d^2 + 18d + 81$

29. $4t^2 + 12t + 9$

30. $4x^2 + 20xy + 25y^2$

31. $m^2 - 8m + 16$

32. $a^2 - 2ab + b^2$

33. $9w^2 - 6w + 1$

34. $c^2 - 4$

35. $25r^2 - 36$

Extra Practice Skills

78. $-\frac{1}{3}t^5 + \frac{1}{2}t^3 + t + 4; -\frac{1}{3}$

90. $6a^{11}$

91. $-6x^3y^4z^5$

92. $-8k^3\ell^3m^3$

93. $6j^3k^2 + 3jk^3$

94. $8q^4r^4 + 12q^4r^2$

95. $6x^3y^3 - 9xy^3$

96. $x^2 - 2x - 3$

97. $x^2 - 5x + 6$

98. $3x^4y + 6x^3y^2 - 2x^2 - 4xy$

99. $2x^3y - 9x^2y + 9xy$

100. $x^3 + x^2 - 10x + 8$

101. $-4x^3 - 4x^2 + 11x - 4$

102. $2x^5 + 6x^4 - 3x^3 - 9x^2 - 5x - 15$

103. $6a^3 + 5a^2b - 5ab^2 - 2b^3$

104. $3a^4 - 2a^3b + 3a^2b^2 - 3a^2b + 2ab^2 - 3b^3$

Additional Answers

Chapter 7

7-3 Exercises

16.

n	$n^2 + 6n - 7$	$(n + 7)(n - 1)$
0	$0^2 + 6(0) - 7 = -7$	$(0 + 7)(0 - 1) = -7$
1	$1^2 + 6(1) - 7 = 0$	$(1 + 7)(1 - 1) = 0$
2	$2^2 + 6(2) - 7 = 9$	$(2 + 7)(2 - 1) = 9$
3	$3^2 + 6(3) - 7 = 20$	$(3 + 7)(3 - 1) = 20$
4	$4^2 + 6(4) - 7 = 33$	$(4 + 7)(4 - 1) = 33$

22. $(x + 3)(x + 12)$
23. $(x - 1)(x - 5)$
24. $(x - 3)(x - 6)$
25. $(x - 4)(x - 8)$
26. $(x + 4)(x - 3)$
27. $(x + 7)(x - 3)$
28. $(x + 12)(x - 3)$
29. $(x - 13)(x + 1)$
30. $(x - 12)(x + 2)$
31. $(x - 7)(x + 5)$
32.

n	$n^2 - 12n - 45$	$(n - 15)(n + 3)$
0	$0^2 - 12(0) - 45 = -45$	$(0 - 15)(0 + 3) = -45$
1	$1^2 - 12(1) - 45 = -56$	$(1 - 15)(1 + 3) = -56$
2	$2^2 - 12(2) - 45 = -65$	$(2 - 15)(2 + 3) = -65$
3	$3^2 - 12(3) - 45 = -72$	$(3 - 15)(3 + 3) = -72$
4	$4^2 - 12(4) - 45 = -77$	$(4 - 15)(4 + 3) = -77$

38. $(x + 5)(x - 4)$
39. $(x - 2)(x - 9)$
40. $(x + 3)(x - 7)$
41. $(x + 1)(x + 9)$
42. $(x - 4)(x - 8)$
43. $(x + 6)(x + 7)$
44. $(x - 4)(x - 3)$
45. $(x + 2)(x + 9)$
46. $(x + 3)(x - 9)$
47. $(x - 3)(x + 8)$
48. $(x - 3)(x - 7)$
49. $(x - 5)(x + 9)$
50.

n	$n^2 + 11n + 28$	$(n + 4)(n + 7)$
0	$0^2 + 11(0) + 28 = 28$	$(0 + 4)(0 + 7) = 28$
1	$1^2 + 11(1) + 28 = 40$	$(1 + 4)(1 + 7) = 40$
2	$2^2 + 11(2) + 28 = 54$	$(2 + 4)(2 + 7) = 54$
3	$3^2 + 11(3) + 28 = 70$	$(3 + 4)(3 + 7) = 70$
4	$4^2 + 11(4) + 28 = 88$	$(4 + 4)(4 + 7) = 88$

7-4 Exercises

13. $(2a - 1)(2a + 5)$
14. $(3x - 1)(5x + 3)$
15. $(2x - 3)(x + 2)$
16. $(3n + 2)(2n - 5)$
17. $(10x + 1)(x - 1)$
18. $(x + 1)(7x - 10)$
19. $-1(2x + 3)(x - 4)$
20. $-1(2n - 1)(2n + 9)$
21. $-1(5x + 3)(x - 2)$
22. $-1(x - 2)(6x - 1)$
23. $-1(2x - 1)(2x + 5)$
24. $-1(5x + 9)(x - 2)$
25. $(3x + 2)(3x + 1)$
26. $(2x + 5)(x + 1)$
27. $(n + 2)(3n + 2)$
28. $(10d + 7)(d + 1)$
29. $(4c - 5)(c - 3)$
30. $2(3x + 1)(x + 2)$
31. $(2x + 5)(4x + 1)$
32. $(3x - 2)(2x - 3)$
33. $(5x - 6)(x + 3)$
34. $(2x + 7)(3x + 1)$
35. $(10n - 7)(n - 1)$
36. $(3x + 2)(x + 3)$
37. $(7x + 1)(x + 2)$
38. $(3n + 1)(n + 1)$
39. $(3x - 4)(x - 5)$
40. $(3x + 4)(2x + 1)$
41. $(x - 7)(4x - 3)$
42. $(5x + 3)\ (2x + 5)$
43. $(4y - 1)\ (3y + 5)$
44. $(3x - 2)(x + 4)$
45. $(2x - 1)(2x + 3)$
46. $(2n + 1)\ (n - 4)$
47. $(3x + 5)(x - 3)$
48. $(n + 1)(3n - 4)$
49. $-1(2x - 3)(2x + 5)$
50. $-1(x - 4)(3x - 4)$
51. $-1(3x - 2)(x + 1)$
52. $12x^2 + 27x + 6$; $3(4x + 1)(x + 2)$
53. $2x^2 - 5x + 2$; $(x - 2)(2x - 1)$
54. $5x^2 + 31x - 28$; $(x + 7)(5x - 4)$
55. $(9n + 8)(n + 1)$
56. $(2x + 1)(x - 4)$
57. $(2x - 1)(2x - 5)$
58. unfactorable
59. $(3x + 8)(x + 2)$
60. $-1(3x - 1)(x + 4)$
61. $(3x + 4)(2x - 3)$

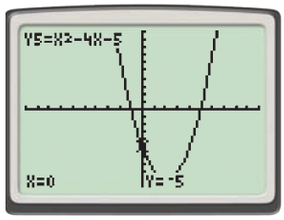
Additional Answers

62. $(5a + 3)(2a + 1)$

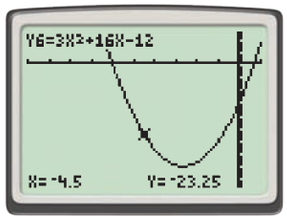
63. $(2x - 3)(2x - 3)$

7-4 Technology Lab

5. $(x - 5)(x + 1)$



6. $(3x - 2)(x + 6)$



7A Ready To Go On?

21. $(n + 4)(n + 5)$

22. $(d - 7)(d + 1)$

23. $(x - 4)(x - 2)$

24. $(y + 10)(y - 3)$

25. $(k - 5)(k - 1)$

26. $(c - 4)(c - 6)$

27.

n	$n^2 + 3n - 4$	$(n + 4)(n - 1)$
0	$0^2 + 3(0) - 4 = -4$	$(0 + 4)(0 - 1) = -4$
1	$1^2 + 3(1) - 4 = 0$	$(1 + 4)(1 - 1) = 0$
2	$2^2 + 3(2) - 4 = 6$	$(2 + 4)(2 - 1) = 6$
3	$3^2 + 3(3) - 4 = 14$	$(3 + 4)(3 - 1) = 14$
4	$4^2 + 3(4) - 4 = 24$	$(4 + 4)(4 - 1) = 24$

28. $(2x + 1)(x + 5)$

29. $(3n + 7)(n + 3)$

30. $(5y + 3)(y - 2)$

31. $2(g - 1)(2g - 3)$

32. $6(p - 4)(p + 1)$

33. $(4d - 3)(3d + 4)$

7-5 Exercises

36. They are similar in that the first and last terms of each are perfect squares. They are different in that a perfect-square trinomial has 3 terms and a difference of 2 squares has 2 terms.

37. Multiply a binomial by itself. Choose 2 perfect squares, find 2 times the product of their square roots, and then write these 3 expressions as a sum.

7B Ready To Go On?

4. no; $-4x \neq 2(\sqrt{2x})(2)$

5. yes; $(3x - 2)^2$

6. No; the last term must be positive.

8. yes; $(x - 11)(x + 11)$

9. No; 20 is not a perfect square.

10. yes; $(1 - 3y^2)(1 + 3y^2)$

11. yes; $(5m + 2m^3)(5m - 2m^3) = m^2(5 + 2m^2)(5 - 2m^2)$

12. No; terms must be subtracted.

13. $(r^2 - t)(r^2 + t)$

21. $3x(x - 2)^2$

22. $4m(2m + 1)(2m - 1)$

23. $5xy(x + 3)(x - 3)$

24. unfactorable

25. $3(c + 7)(c - 3)$

26. $x(x + 3)(x - 3)(x^2 + 9)$

27. $(\ell^2 - 36)$; $(\ell + 6)(\ell - 6)$

28. $a^2 - 8a + 16$; $(a - 4)^2$

29. $2v^2 + 2v - 12$; $2(v^2 + v - 6)$; $2(v + 3)(v - 2)$

30. $3h^3 + 3h^2 - 6h$; $3h(h^2 + h - 2)$; $3h(h + 2)(h - 1)$

31. $(9x)(8x) - (8y)(4y)$; $8(9x^2 - 4y^2)$; $8(3x - 2y)(3x + 2y)$

Extra Practice Skills

27. $(3 + 4a)(a + 3)$

28. $(5 - 2k)(k - 4)$

29. $(5 + 4c^2)(c - 3)$

30. $(3 + t)(t - 4)$

31. $(5 - s)(2r - 1)$

32. $(7 - 2e)(3d + 4)$

33. $(x + 3)(x^2 - 2)$

34. $(2m - 3)(m^2 + 4)$

35. $(3k - 1)(k^2 + 5)$

36. $(3r + 5)(5r^2 - 2)$

37. $(2n - 1)(6n^2 - 5)$

38. $(4z - 3)(z^2 + 1)$

39. $(2k - 3)(k - 4)$

40. $(3p - 2)(p - 4)$

41. $(5d - 3)(2d - 3)$

42. $(3a - 2)(2a^2 - 5)$

43. $(6s - 1)(2s^2 - 3)$

44. $(4c - 3)(c^2 - 5)$

45. $(x + 3)(x + 12)$

46. $(x + 5)(x + 8)$

47. $(x + 2)(x + 8)$

48. $(x - 3)(x - 6)$

49. $(x - 4)(x - 7)$

50. $(x - 6)(x - 7)$

51. $(x - 3)(x + 7)$

52. $(x + 4)(x - 9)$

Additional Answers

53. $(x + 3)(x - 10)$

54.

c	$c^2 - 2c - 48$	$(c - 8)(c + 6)$
0	−48	−48
1	−49	−49
2	−48	−48
3	−45	−45
4	−40	−40

58. $(2x + 3)(x + 5)$

59. $(x + 2)(3x + 8)$

60. $(4x - 2)(2x - 3)$

61. $(2x + 1)(3x + 4)$

62. $(3x - 2)(x - 3)$

63. $(5x - 3)(2x - 5)$

64. $(3x - 4)(2x + 1)$

65. $(4x + 3)(2x - 5)$

66. $(x - 2)(4x - 3)$

67. $(3x - 1)(4x - 3)$

68. $(6x + 5)(x - 2)$

69. $(2x + 3)(3x - 1)$

70. $(2x - 3)(x + 4)$

71. $(3x + 2)(2x - 3)$

72. $(4x - 1)(2x + 3)$

73. $(5x + 2)(2x - 3)$

74. $(4x - 5)(x + 1)$

75. $(3x + 4)(2x - 5)$

76. $-1(2x - 1)(x - 5)$

77. $-1(3x - 4)(2x + 3)$

78. $-1(4x + 3)(2x + 1)$

79. $-1(2x - 5)(2x - 3)$

80. $-1(5x + 2)(2x - 5)$

81. $-1(3x - 7)(x - 2)$

82. $(x - 4)^2$

83. $(2x - 1)^2$

84. no; $-8x \neq 2(x \cdot 3)$

85. no; $-14x \neq 2(3x \cdot 2)$

86. $(2x + 3)^2$

87. No; −16 is not a perfect square.

88. $(3x - 7)^2$

89. no; $18x \neq 2(2x \cdot 5)$

90. $(4x - 3)^2$

91. $(2 - 4x^2)(2 + 4x^2)$

92. No; 35 is not a perfect square.

93. $(c - 5)(c + 5)$

94. No; g^5 is not a perfect square.

95. $(v^2 - 8)(v^2 + 8)$

96. No; 120 is not a perfect square.

112. $12b(b - 2)(b + 2)$

113. $4w^2(3w - 4)(2w + 1)$

114. $2k(3k + 4)(3k - 4)$

115. $a(4a - b)(a + 3)$

116. $3xy(x - y)^2$

117. $4q(3p - 4q)(3p + 4q)$

118. $8a^2(2a - 1)(2a + 1)$

119. $m(m + 2n)(m + 3n)$

120. $x(x + 32)$

121. $3(2d - 1)(3d + 2)$

122. $(2r + 3)(r - 6)$

123. $4(2y - 1)(y + 1)$

124. $9(3 - 2u)(3 + 2u)$

125. $4(2x^2 + 5)(x + 1)(x - 1)$

126. $5j(2j + 7)(j - 2)$

127. $3z(3z - 1)^2$

128. $2(2b + 9)(b - 4)$

129. $3(f + g)(f - g)$

Extra Practice

Applications

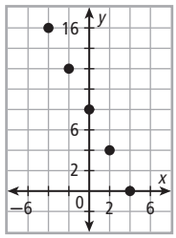
11. $3x - 4$; no; the lengths of the sides cannot be negative.

Additional Answers

Chapter 8

Are You Ready?

5.



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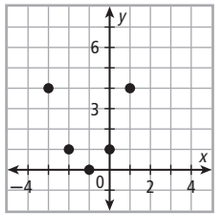

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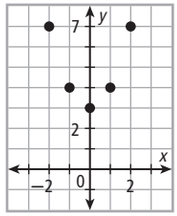

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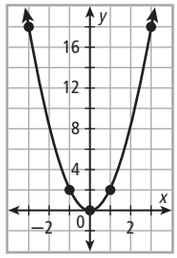


Reading and Writing Math

3–5. Possible answers given.

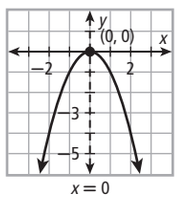
3. Relate it to the word *vary*, which means "differ" or "change"; a quantity that can change.

4. Lines that are exactly the same; the word *coincident* is related to the word *coincidence*, which refers to the occurrence of events at the same time.

5. By itself; the word *isolated* is related to the word *isolation*, which means "the state of being alone."

8-3 Exercises

21.



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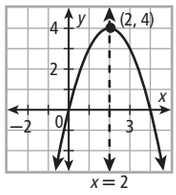

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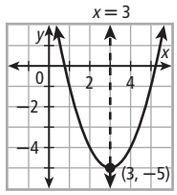

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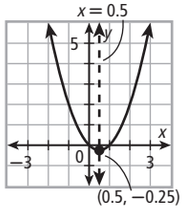

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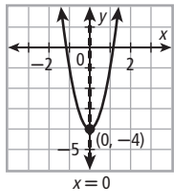

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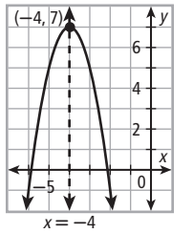
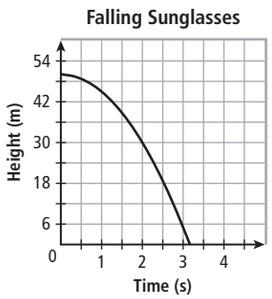
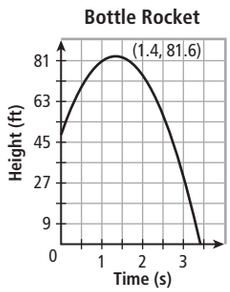


27a.



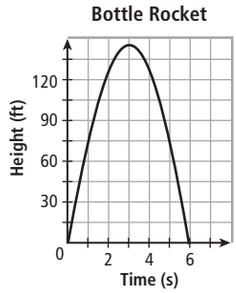
35c.



d. The vertex represents the time, 1.4 s, that the water bottle rocket has spent in the air when it reaches its highest point, 81.6 ft.

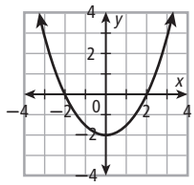
8A Multi-Step Test Prep

2.



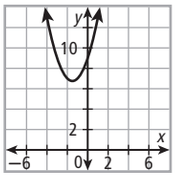
8A Ready To Go On?

7.



D: all real numbers R: $y \geq -2$

15.



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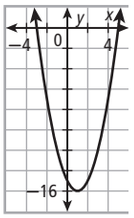

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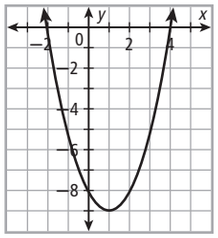

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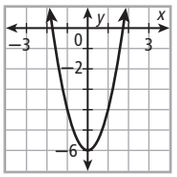

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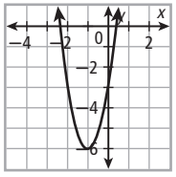
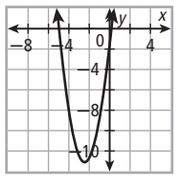


Additional Answers

20. 

21. The graph of $g(x)$ is the same width, has the same axis of symmetry, also opens upward, and its vertex is translated 2 units down to $(0, -2)$.

22. The graph of $g(x)$ is wider, has the same axis of symmetry, also opens upward, and its vertex is the same.

23. The graph of $g(x)$ is narrower, has the same axis of symmetry, also opens upward, and its vertex is translated 3 units up to $(0, 3)$.

24. The graph of $g(x)$ has the same width, has the same axis of symmetry, opens downward, and its vertex is translated 4 units down to $(0, -4)$.

8-7 *Exercises*

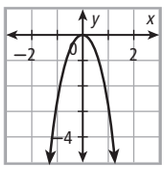
53. $x^2 + 4 = 0$ is equivalent to $x^2 = -4$, which has no real solutions. $x^2 - 4 = 0$ is equivalent to $x^2 = 4$, which has two solutions (± 2).

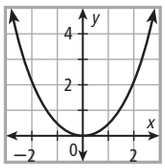
Extra Practice Skills

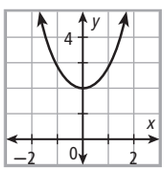
1. Yes; the function can be written in the form $y = ax^2 + bx + c$.

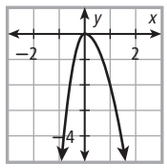
2. No; $a = 0$.

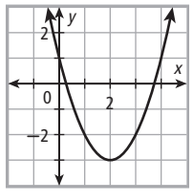
3. Yes; the function can be written in the form $y = ax^2 + bx + c$.

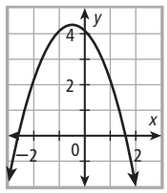
6. 

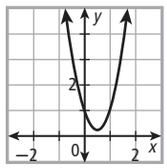
7. 

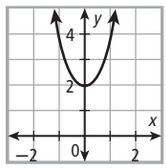
8. 

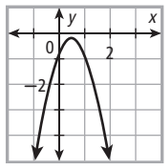
9. 

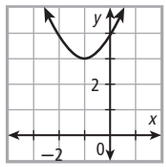
19. 

20. 

21. 

22. 

23. 

24. 

29. narrower; same axis of symmetry; both open upward; vertex of $g(x)$ is translated down 2 units

30. wider; same axis of symmetry; $g(x)$ opens downward; same vertex

31. narrower; same axis of symmetry, $g(x)$ opens downward; vertex of $g(x)$ is translated up 1 unit

98. $x \approx -2.70$ or $x \approx 3.70$

99. $x \approx -1.19$ or $x \approx 1.69$

100. $x \approx -2.19$ or $x \approx 0.69$

Extra Practice Applications

5a. The graph for the ball that was dropped from 576 ft is a vertical translation 176 units up of the graph for the ball that was dropped from 400 ft.

b. 5 s from 400 ft; 6 s from 576 ft

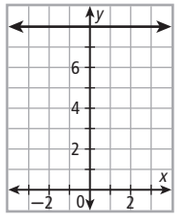
13. No; the discriminant is negative.

Additional Answers

Chapter 9

Are You Ready?

14.



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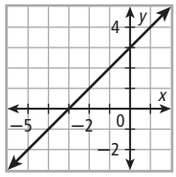

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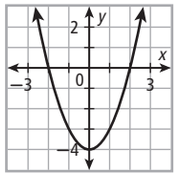

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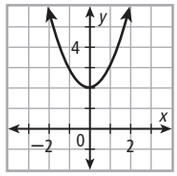
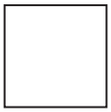
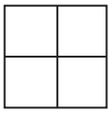


9-1 *Exercises*

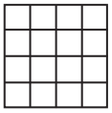
41a. Stage 0:



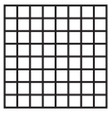
Stage 1:



Stage 2:



Stage 3:

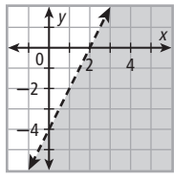


b.

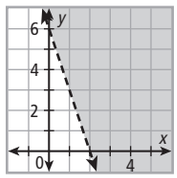
Stage	Squares
0	1
1	4
2	16
3	64

54. Susanna assumed the sequence was geometric with $r = 2$. She used the formula to find $a_8 = 128$. Paul noticed a pattern of "add 1, add 2, and so on." He continued this pattern by adding 3, adding 4, etc., until he got the 8th term of 29. Both could be considered correct because it was not specified what type of sequence was given.

58.



59.



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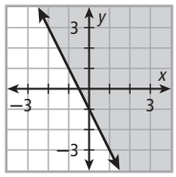
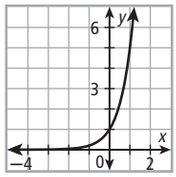


Lesson 9-2

6.



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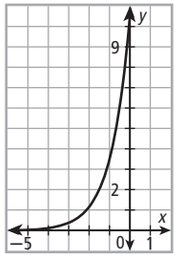

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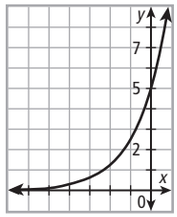

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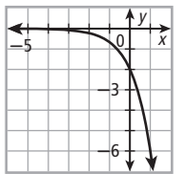

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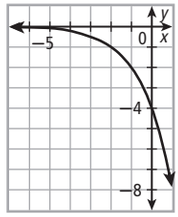

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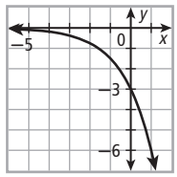

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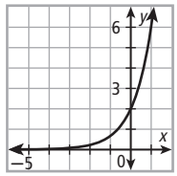

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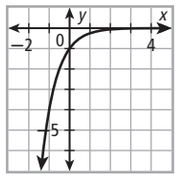

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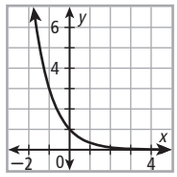

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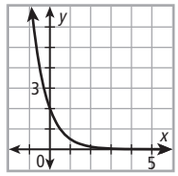

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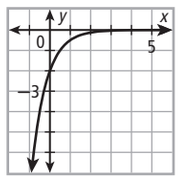


21. As the x-values change by a constant amount, the y-values are multiplied by a constant amount.

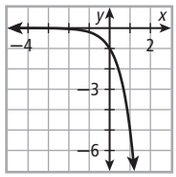
22. As the x-values change by a constant amount, the y-values are not multiplied by a constant amount.

23. As the x-values change by a constant amount, the y-values are not multiplied by a constant amount.

24. As the x-values change by a constant amount, the y-values are multiplied by a constant amount.

Additional Answers

29.



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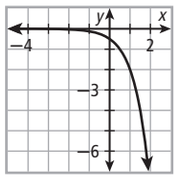

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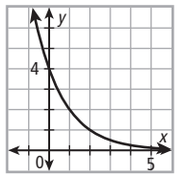

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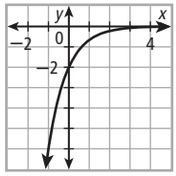

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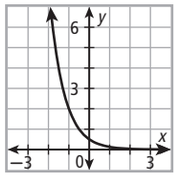

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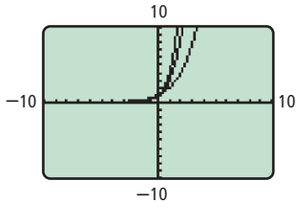
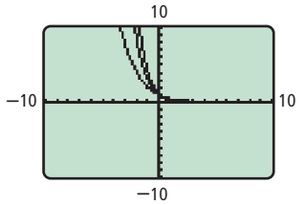


Possible answer: The graphs have the same basic shape and the same *y*-intercept; each graph is steeper than the one before it.

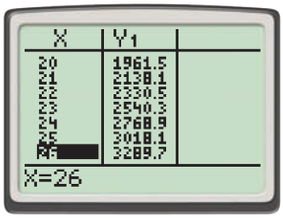
39.



Possible answer: The graphs have the same basic shape and the same *y*-intercept; each graph is steeper than the one before it.

9A *Multi-Step Test Prep*

2.



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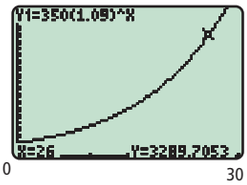
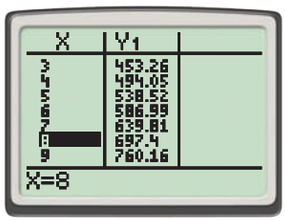


0 30

4.



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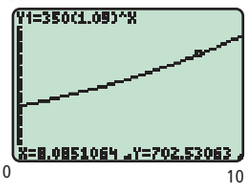

0 10

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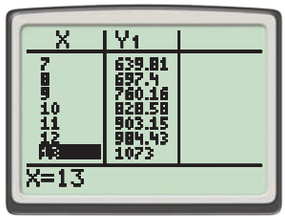

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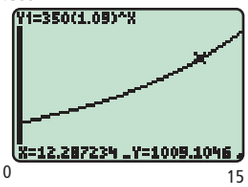
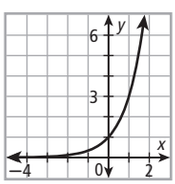


0 15

9A *Ready To Go On?*

7.



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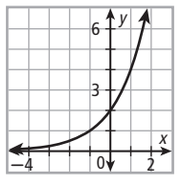

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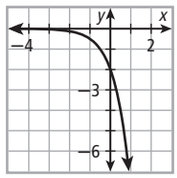

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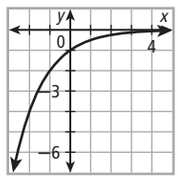
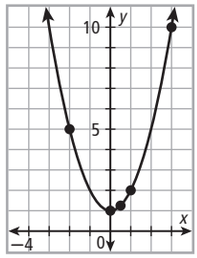


12. $y = 30{,}000(1.03)^t$; \$40,317.49

13. $y = 2000(1.00375)^{12t}$; \$2288.50

14. $y = 1200(0.8)^t$; \$491.52

16.



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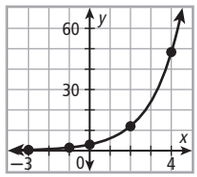


Extra Practice Skills

1. 625; 3,125; 15,625

2. 46, 23, 11.5

9. Yes; as the *x*-values increase by a constant amount, the *y*-values are multiplied by a constant amount.

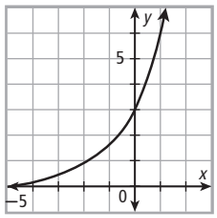
10. No; as the *x*-values increase by a constant amount, the *y*-values are not multiplied by a constant amount.

11. Yes; as the *x*-values increase by a constant amount, the *y*-values are multiplied by a constant amount.

12. No; as the *x*-values increase by a constant amount, the *y*-values are not multiplied by a constant amount.

Additional Answers

13.



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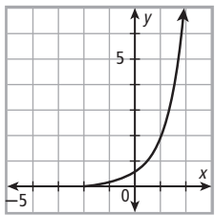

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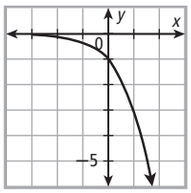

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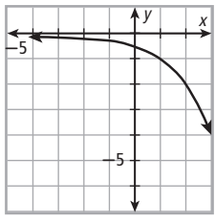

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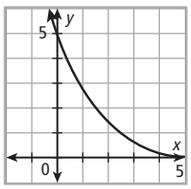

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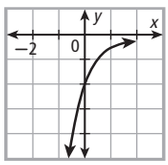

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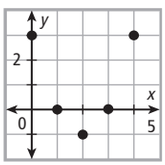

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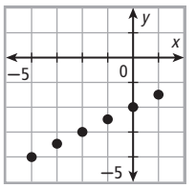

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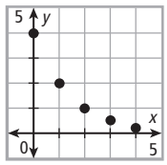

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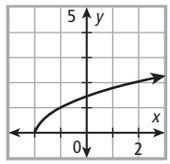

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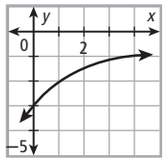

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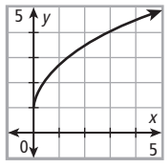

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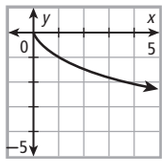

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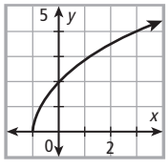

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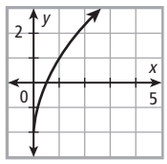


Extra Practice Applications

5. The stock price increases by 10% per year; $y = 10(1.1)^x$; $19.49

Additional Answers

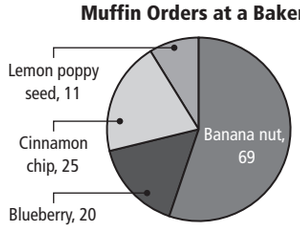
Chapter 10

10-1 *Lesson Quiz*

1. Lamar Place and Candlerun

2. week 1

3. circle graph; to compare each type of muffin to all muffin orders



10-2 *Check It Out!*

4a.

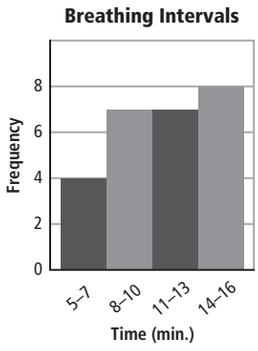
Interval	Frequency	Cumulative Frequency
28–31	2	2
32–35	7	9
36–39	5	14
40–43	3	17

10-2 *Exercises*

4.

Interval	Frequency
19–22	4
23–26	6
27–30	5
31–34	3

5.



6a.

Interval	Frequency	Cumulative Frequency
750–790	1	1
700–740	2	3
650–690	2	5
600–640	3	8
550–590	2	10
500–540	5	15

7.

Summer		Winter
	0	4 9 9
	1	1 2 3 4 9 9
9 7 7 6 5 5 3 3 2 2	2	1 7
	3	0 3 5
	4	
9 7 4 3	5	

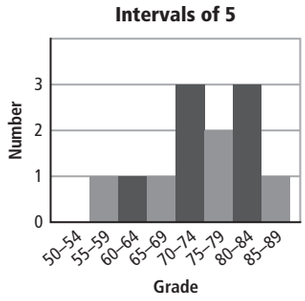
Key: 2\|1 means 21
7\|2 means 27

13a.

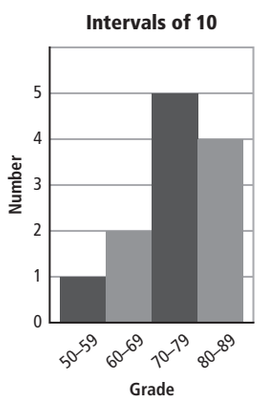
Stem	Leaves
5	9
6	0 8
7	0 2 2 5 7
8	1 4 4 8

Key: 5\|9 means 59

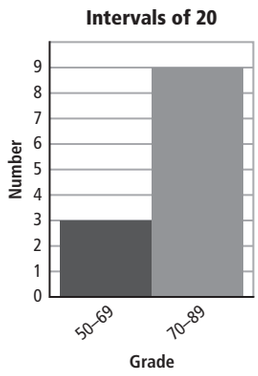
b.



c.



d.



e. As the size of the interval increases, the number of bars decreases.

f. The histogram that uses intervals of 20; it makes Damien's grades look highest because the bar for 70–89 is much taller than the bar for 50–69.

10-3 *Exercises*

4. mean: 19.75; median: 21; modes: 10, 20, and 25; range: 16

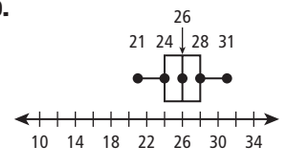
5. mean: 78.25; median: 78; mode: 78; range: 15

6. 96; the outlier increases the mean by 16.5, the median by 1.5, and the range by 79. It has no effect on the mode.

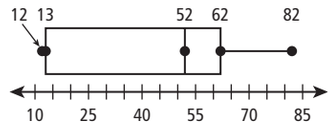
7. 13; the outlier decreases the mean by 11.15 and the median by 4. It increases the range by 51 and has no effect on the mode.

8. median: 83; the mean is lower than all but one of the scores because of the outlier. There is no mode.

10.



11.



12. Simon; the vertical line in the box for Simon is farther to the right than the vertical line in the box for Natasha.

14. mean: 79.5; median: 82; mode: none; range: 28

15. mean: 2.5; median: 2.5; modes: 2 and 3; range: 3

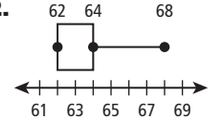
16. mean: 26.875; median: 28; modes: 19, 31, and 34; range: 15

17. mean: 60; median: 60; mode: 60; range: 5

18. 8; the outlier decreases the mean by 6.5 and the median by 2.5. It increases the range by 21 and has no effect on the mode.

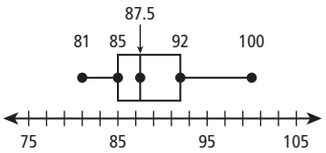
19. 23; the outlier increases the mean by 3, the median by 2.5, and the range by 15. It has no effect on the mode.

22.



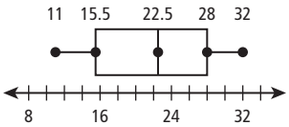
Additional Answers

23.



10-3 *Lesson Quiz*

4.



10-4 *Additional Examples*

Example 1

A. The scale on the vertical axis exaggerates the percent of satisfied customers.

B. Someone might believe that brand B has a much greater percentage of satisfied customers.

Example 2

A. The intervals on the vertical axis are not equal.

B. Someone might believe that the amount of rainfall fell dramatically from 1997 to 1999.

Example 3

A. The sectors do not add to 100%.

B. Someone might believe that the county spends most of its money on road maintenance.

Example 4

Although 3 is the mean number of pets per household, 4 of the 5 results are less than 3. In this case, the median of the data, 2, is a better measure.

10-4 *Exercises*

17a. The first question asks whether 2 people can have the same fingerprint. The second question asks whether someone could have made a mistake.

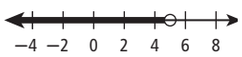
b. The fingerprint had to belong to Dr. Arenson.

c. Someone who wants to prove that the fingerprint belongs to Dr. Arenson.

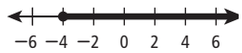
d. The fingerprint might not belong to Dr. Arenson.

e. Someone who wants to prove that the fingerprint does not belong to Dr. Arenson.

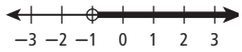
22.



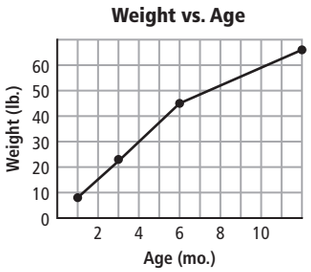
23.



24.



25.



A line graph shows the change in weight over time.

10-4 *Lesson Quiz*

1. The scale exaggerates the differences among the sitting fees; someone might believe that studio Z charges much less than its competitors.

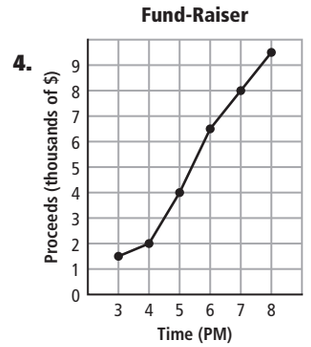
2. The vertical axis does not start at 0 which makes it appear that the number of members varied greatly from month to month; the number of members did not vary much throughout the year.

3. The sectors do not add to 100%.

4. Only 5 people were asked whether they liked to snow ski. The sample is too small.

10A *Ready To Go On?*

4.



A line graph shows change over time.

5.

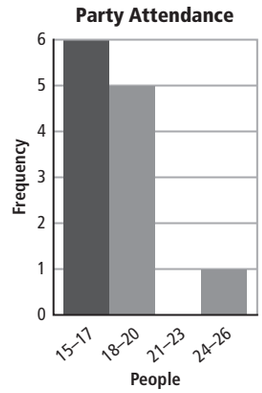
Stem	Leaves
2	2 4 6 6 7 8
3	0 2 3
4	1

Key: 2|7 means $27,000

6a.

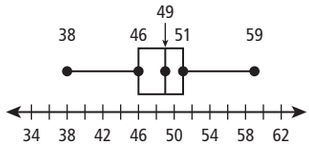
Last 12 Parties	
Number of People	**Frequency**
15–17	6
18–20	5
21–23	0
24–26	1

b.



7c. Median or mode; the mean is lower than most of the temperatures because 1 day had a high of only 38 °F.

8.



9. The vertical axis begins at 80. This might make someone believe that the value of the stock has decreased dramatically. Another company might want to devalue this company's stock.

10. The survey did not address a random sample. Because the survey was online, those who responded were probably already somewhat comfortable using technology.

10-7 *Exercises*

5. Independent; your order does not affect what your friend orders.

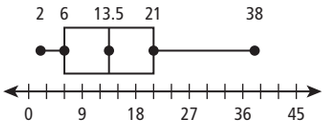
6. Dependent; the appointments that were already scheduled affect the appointment times available to you.

Chapter 10 Test

7. mean: ≈ 14.3; median: 13.5; mode: 14; range: 36

Additional Answers

8.



11. The total of the percentages is only 20%.

12. Someone might believe that most of the money raised goes to charitable causes.

13. The managers of the charity might be able to get more people to contribute under the invalid assumption that most of their money is going to charitable causes.

Extra Practice Skills

8.

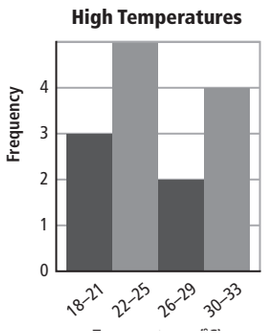
Stem	Leaves
1	8 9 9
2	2 4 5 5 5 8 9
3	0 2 2 3

Key: 1|8 means 18

9.

High Temperatures	
Temperature (°C)	**Frequency**
18–21	3
22–25	5
26–29	2
30–33	4

10.



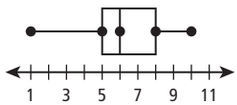
11.

High Temperatures		
Temperature (°C)	**Frequency**	**Cumulative Frequency**
18–21	3	3
22–25	5	8
26–29	2	10
30–33	4	14

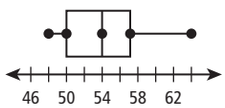
14. 71; increases mean by 9, median by 0.5, and range by 56; no effect on mode

15. 7; decreases mean by 5 and range by 29; no effect on median and mode.

16.



17.



18a. The sectors do not add to 100%.

b. Most listeners are between the ages of 25 and 36.

c. Possible answer: A person selling advertising time at the station might want to use the graph to convince advertisers that most listeners are between the ages of 25 and 36.

19. The sample is biased because people at the library are likely to spend more time reading than other people in the town.

31. Dep.; after you pick a bottle, there are fewer bottles in the basket.

32. Ind.; the result of rolling the number cube does not affect the result of tossing the coin.

Extra Practice Applications

4.

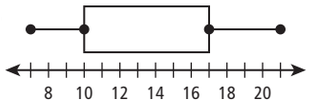
Stem	Leaves
6	3 5
7	1 3 5 6 7 7 9
8	0 0 2 3 8
9	1 2 4 9

Key: 6|5 means 65

5.

Customers Per Day	
Customers	**Frequency**
25–29	3
30–34	5
35–39	2
40–44	4

7.



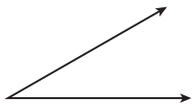
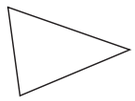
8. The mean is $582, but 4 of the 5 employees make less than this amount.

9. The scale on the vertical axis does not begin at 0; Anders's sales were three times those of Williams's.

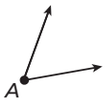
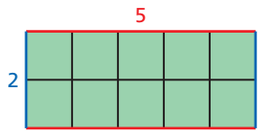
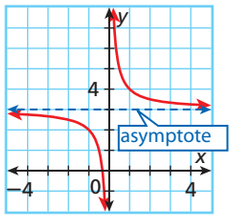
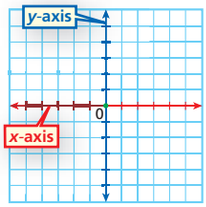
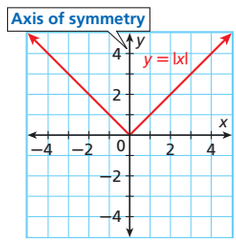
Glossary/Glosario

Learn It Online
Multilingual Glossary

A

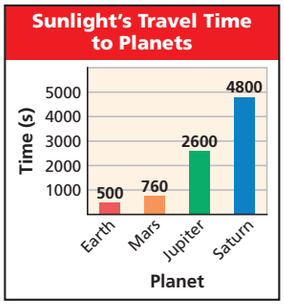
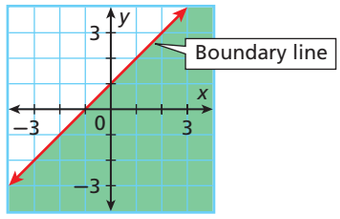
ENGLISH	SPANISH	EXAMPLES
absolute value The absolute value of x is the distance from zero to x on a number line, denoted $\lvert x \rvert$. $\lvert x \rvert = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$	**valor absoluto** El valor absoluto de x es la distancia de cero a x en una recta numérica, y se expresa $\lvert x \rvert$. $\lvert x \rvert = \begin{cases} x & \text{si } x \geq 0 \\ -x & \text{si } x < 0 \end{cases}$	$\lvert 3 \rvert = 3$ $\lvert -3 \rvert = 3$
absolute-value equation An equation that contains absolute-value expressions.	**ecuación de valor absoluto** Ecuación que contiene expresiones de valor absoluto.	$\lvert x + 4 \rvert = 7$
absolute-value function A function whose rule contains absolute-value expressions.	**función de valor absoluto** Función cuya regla contiene expresiones de valor absoluto.	$y = \lvert x + 4 \rvert$
absolute-value inequality An inequality that contains absolute-value expressions.	**desigualdad de valor absoluto** Desigualdad que contiene expresiones de valor absoluto.	$\lvert x + 4 \rvert > 7$
accuracy The closeness of a given measurement or value to the actual measurement or value.	**exactitud** Cercanía de una medida o un valor a la medida o el valor real.	
acute angle An angle that measures greater than 0° and less than 90°.	**ángulo agudo** Ángulo que mide más de 0° y menos de 90°.	
acute triangle A triangle with three acute angles.	**triángulo acutángulo** Triángulo con tres ángulos agudos.	
Addition Property of Equality For real numbers a, b, and c, if $a = b$, then $a + c = b + c$.	**Propiedad de igualdad de la suma** Dados los números reales a, b y c, si $a = b$, entonces $a + c = b + c$.	$x - 6 = 8$ $+6 \quad +6$ $x = 14$
Addition Property of Inequality For real numbers a, b, and c, if $a < b$, then $a + c < b + c$. Also holds true for $>$, $\leq$, $\geq$, and $\neq$.	**Propiedad de desigualdad de la suma** Dados los números reales a, b y c, si $a < b$, entonces $a + c < b + c$. Es válido también para $>$, $\leq$, $\geq$ y $\neq$.	$x - 6 < 8$ $+6 \quad +6$ $x < 14$
additive inverse The opposite of a number. Two numbers are additive inverses if their sum is zero.	**inverso aditivo** El opuesto de un número. Dos números son inversos aditivos si su suma es cero.	The additive inverse of 5 is -5. The additive inverse of -5 is 5.

Glossary/Glosario **G1**

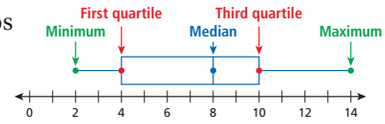
ENGLISH	SPANISH	EXAMPLES
AND A logical operator representing the intersection of two sets.	**Y** Operador lógico que representa la intersección de dos conjuntos.	$A = \{2, 3, 4, 5\}$ $B = \{1, 3, 5, 7\}$ The set of values that are in A AND B is $A \cap B = \{3, 5\}$.
angle A figure formed by two rays with a common endpoint.	**ángulo** Figura formada por dos rayos con un extremo común.	
area The number of nonoverlapping unit squares of a given size that will exactly cover the interior of a plane figure.	**área** Cantidad de cuadrados unitarios de un determinado tamaño no superpuestos que cubren exactamente el interior de una figura plana.	 The area is 10 square units.
arithmetic sequence A sequence whose successive terms differ by the same nonzero number d, called the *common difference*.	**sucesión aritmética** Sucesión cuyos términos sucesivos difieren en el mismo número distinto de cero d, denominado *diferencia común*.	4, 7, 10, 13, 16, … $d = 3$
Associative Property of Addition For all numbers a, b, and c, $(a + b) + c = a + (b + c)$.	**Propiedad asociativa de la suma** Dados tres números cualesquiera a, b y c, $(a + b) + c = a + (b + c)$.	$(5 + 3) + 7 = 5 + (3 + 7)$
Associative Property of Multiplication For all numbers a, b, and c, $(a \cdot b) \cdot c = a \cdot (b \cdot c)$.	**Propiedad asociativa de la multiplicación** Dados tres números cualesquiera a, b y c, $(a \cdot b) \cdot c = a \cdot (b \cdot c)$.	$(5 \cdot 3) \cdot 7 = 5 \cdot (3 \cdot 7)$
asymptote A line that a graph gets closer to as the value of a variable becomes extremely large or small.	**asíntota** Línea recta a la cual se aproxima una gráfica a medida que el valor de una variable se hace sumamente grande o pequeño.	
average *See* mean.	**promedio** *Ver* media.	
axis of a coordinate plane One of two perpendicular number lines, called the x-axis and the y-axis, used to define the location of a point in a coordinate plane.	**eje de un plano cartesiano** Una de las dos rectas numéricas perpendiculares, denominadas eje x y eje y, utilizadas para definir la ubicación de un punto en un plano cartesiano.	
axis of symmetry A line that divides a plane figure or a graph into two congruent reflected halves.	**eje de simetría** Línea que divide una figura plana o una gráfica en dos mitades reflejadas congruentes.	

G2 Glossary/Glosario

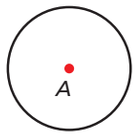
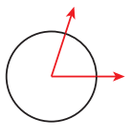
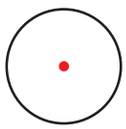
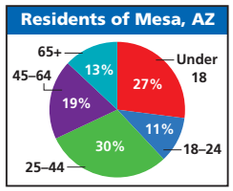
B

ENGLISH	SPANISH	EXAMPLES
back-to-back stem-and-leaf plot (A graph used to organize and compare two sets of data so that the frequencies can be compared. *See also* stem-and-leaf plot.	**diagrama doble de tallo y hojas** Gráfica utilizada para organizar y comparar dos conjuntos de datos para poder comparar las frecuencias. *Ver también* diagrama de tallo y hojas.	Data set A: 9, 12, 14, 16, 23, 27 Data set B: 6, 8, 10, 13, 15, 16, 21 Set A | Set B 9 | 0 | 6 8 6 4 2 | 1 | 0 3 5 6 7 3 | 2 | 1 *Key:* |2|1 means 21 7|2| means 27
bar graph A graph that uses vertical or horizontal bars to display data.	**gráfica de barras** Gráfica con barras horizontales o verticales para mostrar datos.	
base of a power The number in a power that is used as a factor.	**base de una potencia** Número de una potencia que se utiliza como factor.	$3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$ 3 is the base.
base of an exponential function The value of b in a function of the form $f(x) = ab^x$, where a and b are real numbers with $a \neq 0$, $b > 0$, and $b \neq 1$.	**base de una función exponencial** Valor de b en una función del tipo $f(x) = ab^x$, donde a y b son números reales con $a \neq 0$, $b > 0$ y $b \neq 1$.	In the function $f(x) = 5(2)^x$, the base is 2.
biased sample A sample that does not fairly represent the population.	**muestra no representativa** Muestra que no representa adecuadamente una población.	To find out about the exercise habits of average Americans, a fitness magazine surveyed its readers about how often they exercise. The population is all Americans and the sample is readers of the fitness magazine. This sample will likely be biased because readers of fitness magazines may exercise more often than other people do.
binomial A polynomial with two terms.	**binomio** Polinomio con dos términos.	$x + y$ $2a^2 + 3$ $4m^3n^2 + 6mn^4$
boundary line A line that divides a coordinate plane into two half-planes.	**línea de límite** Línea que divide un plano cartesiano en dos semiplanos.	

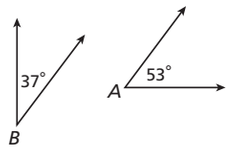
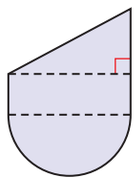
Glossary/Glossario **G3**

ENGLISH	SPANISH	EXAMPLES
box-and-whisker plot A method of showing how data are distributed by using the median, quartiles, and minimum and maximum values; also called a *box plot*.	**gráfica de mediana y rango** Método para mostrar la distribución de datos utilizando la mediana, los cuartiles y los valores mínimo y máximo; también llamado *gráfica de caja*.	

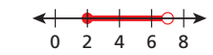
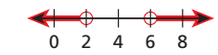
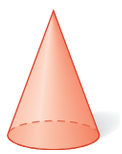
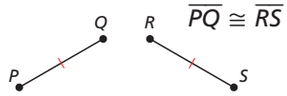
C

Cartesian coordinate system *See* coordinate plane.	**sistema de coordenadas cartesianas** *Ver* plano cartesiano.	
center of a circle The point inside a circle that is the same distance from every point on the circle.	**centro de un círculo** Punto dentro de un círculo que se encuentra a la misma distancia de todos los puntos del círculo.	
central angle of a circle An angle whose vertex is the center of a circle.	**ángulo central de un círculo** Ángulo cuyo vértice es el centro de un círculo.	
circle The set of points in a plane that are a fixed distance from a given point called the center of the circle.	**círculo** Conjunto de puntos en un plano que se encuentran a una distancia fija de un punto determinado denominado centro del círculo.	
circle graph A way to display data by using a circle divided into non-overlapping sectors.	**gráfica circular** Forma de mostrar datos mediante un círculo dividido en sectores no superpuestos.	
circumference The distance around a circle.	**circunferencia** Distancia alrededor de un círculo.	
closure A set of numbers is said to be closed, or to have closure, under a given operation if the result of the operation on any two numbers in the set is also in the set.	**cerradura** Se dice que un conjunto de números es cerrado, o tiene cerradura, respecto de una operación determinada, si el resultado de la operación entre dos números cualesquiera del conjunto también está en el conjunto.	The natural numbers are closed under addition because the sum of two natural numbers is always a natural number.
coefficient A number that is multiplied by a variable.	**coeficiente** Número que se multiplica por una variable.	In the expression $2x + 3y$, 2 is the coefficient of x and 3 is the coefficient of y.

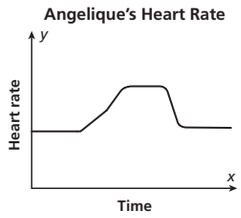
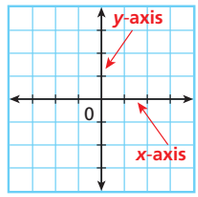
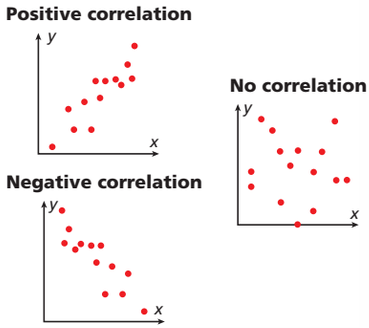
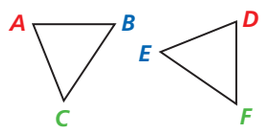
G4 *Glossary/Glosario*

ENGLISH	SPANISH	EXAMPLES
common difference In an arithmetic sequence, the nonzero constant difference of any term and the previous term.	**diferencia común** En una sucesión aritmética, diferencia constante distinta de cero entre cualquier término y el término anterior.	In the arithmetic sequence 3, 5, 7, 9, 11, ..., the common difference is 2.
common factor A factor that is common to all terms of an expression or to two or more expressions.	**factor común** Factor que es común a todos los términos de una expresión o a dos o más expresiones.	Expression: $4x^2 + 16x^3 - 8x$ Common factor: $4x$ Expressions: 12 and 18 Common factors: 2, 3, and 6
common ratio In a geometric sequence, the constant ratio of any term and the previous term.	**razón común** En una sucesión geométrica, la razón constante entre cualquier término y el término anterior.	In the geometric sequence 32, 16, 8, 4, 2, . . ., the common ratio is $\frac{1}{2}$.
Commutative Property of Addition For any two numbers a and b, $a + b = b + a$.	**Propiedad conmutativa de la suma** Dados dos números cualesquiera a y b, $a + b = b + a$.	$3 + 4 = 4 + 3 = 7$
Commutative Property of Multiplication For any two numbers a and b, $a \cdot b = b \cdot a$.	**Propiedad conmutativa de la multiplicación** Dados dos números cualesquiera a y b, $a \cdot b = b \cdot a$.	$3 \cdot 4 = 4 \cdot 3 = 12$
complement of an event The set of all outcomes that are not the event.	**complemento de un suceso** Todos los resultados que no están en el suceso.	In the experiment of rolling a number cube, the complement of rolling a 3 is rolling a 1, 2, 4, 5, or 6.
complementary angles Two angles whose measures have a sum of 90°.	**ángulos complementarios** Dos ángulos cuyas medidas suman 90°.	
completing the square A process used to form a perfect-square trinomial. To complete the square of $x^2 + bx$, add $\left(\frac{b}{2}\right)^2$.	**completar el cuadrado** Proceso utilizado para formar un trinomio cuadrado perfecto. Para completar el cuadrado de $x^2 + bx$, hay que sumar $\left(\frac{b}{2}\right)^2$.	$x^2 + 6x +$ ▢ Add $\left(\frac{6}{2}\right)^2 = 9$. $x^2 + 6x + 9$
complex fraction A fraction that contains one or more fractions in the numerator, the denominator, or both.	**fracción compleja** Fracción que contiene una o más fracciones en el numerador, en el denominador, o en ambos.	$\dfrac{\frac{1}{2}}{1 + \frac{2}{3}}$
composite figure A plane figure made up of triangles, rectangles, trapezoids, circles, and other simple shapes, or a three-dimensional figure made up of prisms, cones, pyramids, cylinders, and other simple three-dimensional figures.	**figura compuesta** Figura plana compuesta por triángulos, rectángulos, trapecios, círculos y otras figuras simples, o figura tridimensional compuesta por prismas, conos, pirámides, cilindros y otras figuras tridimensionales simples.	

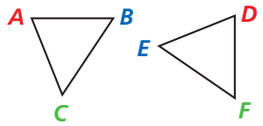
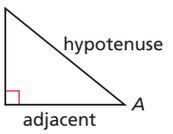
Glossary/Glosario **G5**

ENGLISH	SPANISH	EXAMPLES
compound event An event made up of two or more simple events.	**suceso compuesto** Suceso formado por dos o más sucesos simples.	In the experiment of tossing a coin and rolling a number cube, the event of the coin landing heads and the number cube landing on 3.
compound inequality Two inequalities that are combined into one statement by the word *and* or *or*.	**desigualdad compuesta** Dos desigualdades unidas en un enunciado por la palabra *y* u *o*.	$x \geq 2$ AND $x < 7$ (also written $2 \leq x < 7$)  $x < 2$ OR $x > 6$ 
compound interest Interest earned or paid on both the principal and previously earned interest. The formula for compound interest is $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A is the final amount, P is the principal, r is the interest rate expressed as a decimal, n is the number of times interest is compounded, and t is the time.	**interés compuesto** Intereses ganados o pagados sobre el capital y los intereses ya devengados. La fórmula de interés compuesto es $A = P\left(1 + \frac{r}{n}\right)^{nt}$, donde A es la cantidad final, P es el capital, r es la tasa de interés expresada como un decimal, n es la cantidad de veces que se capitaliza el interés y t es el tiempo.	If \$100 is put into an account with an interest rate of 5% compounded monthly, then after 2 years, the account will have $100\left(1 + \frac{0.05}{12}\right)^{12 \cdot 2} = \$110.49$.
compound statement Two statements that are connected by the word *and* or *or*.	**enunciado compuesto** Dos enunciados unidos por la palabra *y* u *o*.	The sky is blue and the grass is green. I will drive to school or I will take the bus.
cone A three-dimensional figure with a circular base and a curved surface that connects the base to a point called the vertex.	**cono** Figura tridimensional con una base circular y una superficie lateral curva que conecta la base con un punto denominado vértice.	
congruent Having the same size and shape, denoted by $\cong$.	**congruente** Que tiene el mismo tamaño y la misma forma, expresado por $\cong$.	 $\overline{PQ} \cong \overline{RS}$
conjugate of an irrational number The conjugate of a number in the form $a + \sqrt{b}$ is $a - \sqrt{b}$.	**conjugado de un número irracional** El conjugado de un número en la forma $a + \sqrt{b}$ es $a - \sqrt{b}$.	The conjugate of $1 + \sqrt{2}$ is $1 - \sqrt{2}$.
consistent system A system of equations or inequalities that has at least one solution.	**sistema consistente** Sistema de ecuaciones o desigualdades que tiene por lo menos una solución.	$\begin{cases} x + y = 6 \\ x - y = 4 \end{cases}$ solution: $(5, 1)$
constant A value that does not change.	**constante** Valor que no cambia.	3, 0, π

G6 *Glossary/Glosario*

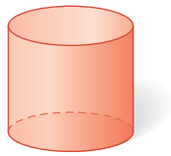
ENGLISH	SPANISH	EXAMPLES
constant of variation The constant k in direct and inverse variation equations.	**constante de variación** La constante k en ecuaciones de variación directa e inversa.	$y = 5x$ ↑ constant of variation
continuous graph A graph made up of connected lines or curves.	**gráfica continua** Gráfica compuesta por líneas rectas o curvas conectadas.	
convenience sample A sample based on members of the population that are readily available.	**muestra de conveniencia** Una muestra basada en miembros de la población que están fácilmente disponibles.	A reporter surveys people he personally knows.
conversion factor The ratio of two equal quantities, each measured in different units.	**factor de conversión** Razón entre dos cantidades iguales, cada una medida en unidades diferentes.	$\frac{12 \text{ inches}}{1 \text{ foot}}$
coordinate plane A plane that is divided into four regions by a horizontal line called the x-axis and a vertical line called the y-axis.	**plano cartesiano** Plano dividido en cuatro regiones por una línea horizontal denominada eje x y una línea vertical denominada eje y.	
correlation A measure of the strength and direction of the relationship between two variables or data sets.	**correlación** Medida de la fuerza y dirección de la relación entre dos variables o conjuntos de datos.	
correlation coefficient A number r, where $-1 \leq r \leq 1$, that describes how closely the points in a scatter plot cluster around the least-squares line.	**coeficiente de correlación** Número r, donde $-1 \leq r \leq 1$, que describe a qué distancia de la recta de mínimos cuadrados se agrupan los puntos de un diagrama de dispersión.	An r-value close to 1 describes a strong positive correlation. An r-value close to 0 describes a weak correlation or no correlation. An r-value close to –1 describes a strong negative correlation.
corresponding angles of polygons Angles in the same relative position in polygons with an equal number of angles.	**ángulos correspondientes de los polígonos** Ángulos que se ubican en la misma posición relativa en polígonos que tienen el mismo número de ángulos.	 $\angle A$ and $\angle D$ are corresponding angles.

Glossary/Glossario **G7**

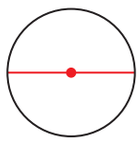
ENGLISH	SPANISH	EXAMPLES
corresponding sides of polygons Sides in the same relative position in polygons with an equal number of sides.	**lados correspondientes de los polígonos** Lados que se ubican en la misma posición relativa en polígonos que tienen el mismo número de lados.	 $\overline{AB}$ and $\overline{DE}$ are corresponding sides.
cosine In a right triangle, the cosine of angle A is the ratio of the length of the leg adjacent to angle A to the length of the hypotenuse.	**coseno** En un triángulo rectángulo, el coseno del ángulo A es la razón entre la longitud del cateto adyacente al ángulo A y la longitud de la hipotenusa.	 $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$
cross products In the statement $\frac{a}{b} = \frac{c}{d}$, bc and ad are the cross products.	**productos cruzados** En el enunciado $\frac{a}{b} = \frac{c}{d}$, bc y ad son productos cruzados.	$\frac{1}{2} = \frac{3}{6}$ Cross products: $2 \cdot 3 = 6$ and $1 \cdot 6 = 6$
Cross Product Property For any real numbers a, b, c, and d, where $b \neq 0$ and $d \neq 0$, if $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.	**Propiedad de productos cruzados** Dados los números reales a, b, c y d, donde $b \neq 0$ y $d \neq 0$, si $\frac{a}{b} = \frac{c}{d}$, entonces $ad = bc$.	If $\frac{4}{6} = \frac{10}{x}$, then $4x = 60$, so $x = 15$.
cube A prism with six square faces.	**cubo** Prisma con seis caras cuadradas.	
cube in numeration The third power of a number.	**cubo en numeración** Tercera potencia de un número.	8 is the cube of 2.
cube root A number, written as $\sqrt[3]{x}$, whose cube is x.	**raíz cúbica** Número, expresado como $\sqrt[3]{x}$, cuyo cubo es x.	$\sqrt[3]{64} = 4$, because $4^3 = 64$; 4 is the cube root of 64.
cubic equation An equation that can be written in the form $ax^3 + bx^2 + cx + d = 0$, where a, b, c, and d are real numbers and $a \neq 0$.	**ecuación cúbica** Ecuación que se puede expresar como $ax^3 + bx^2 + cx + d = 0$, donde a, b, c, y d son números reales y $a \neq 0$.	$4x^3 + x^2 - 3x - 1 = 0$
cubic function A function that can be written in the form $f(x) = ax^3 + bx^2 + cx + d$, where a, b, c, and d are real numbers and $a \neq 0$.	**función cúbica** Función que se puede expresar como $f(x) = ax^3 + bx^2 + cx + d$, donde a, b, c, y d son números reales y $a \neq 0$.	$f(x) = x^3 + 2x^2 - 6x + 8$
cubic polynomial A polynomial of degree 3.	**polinomio cúbico** Polinomio de grado 3.	$x^3 + 4x^2 - 6x + 2$
cumulative frequency The frequency of all data values that are less than or equal to a given value.	**frecuencia acumulativa** Frecuencia de todos los valores de los datos que son menores que o iguales a un valor dado.	For the data set 2, 2, 3, 5, 5, 6, 7, 7, 8, 8, 8, 9, the cumulative frequency table is shown below.

Data	Frequency	Cumulative Frequency
2	2	2
3	1	3
5	2	5
6	1	6
7	2	8
8	3	11
9	1	12

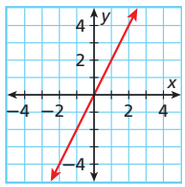
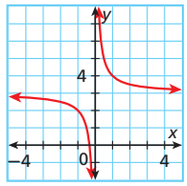
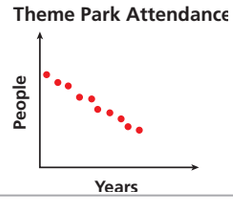
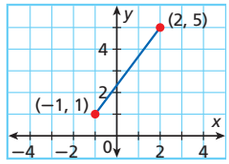
G8 *Glossary/Glosario*

ENGLISH	SPANISH	EXAMPLES
cylinder A three-dimensional figure with two parallel congruent circular bases and a curved surface that connects the bases.	**cilindro** Figura tridimensional con dos bases circulares congruentes paralelas y una superficie lateral curva que conecta las bases.	

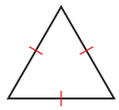
D

data Information gathered from a survey or experiment.	**datos** Información reunida en una encuesta o experimento.	
degree measure of an angle A unit of angle measure; one degree is $\frac{1}{360}$ of a circle.	**medida en grados de un ángulo** Unidad de medida de los ángulos; un grado es $\frac{1}{360}$ de un círculo.	
degree of a monomial The sum of the exponents of the variables in the monomial.	**grado de un monomio** Suma de los exponentes de las variables del monomio.	$4x^2y^5z^3$ Degree: $2 + 5 + 3 = 10$ $5 = 5x^0$ Degree: 0
degree of a polynomial The degree of the term of the polynomial with the greatest degree.	**grado de un polinomio** Grado del término del polinomio con el grado máximo.	$3x^2y^2 + 4xy^5 - 12x^3y^2$ Degree 4 Degree 6 Degree 5 Degree 6
dependent events Events for which the occurrence or nonoccurrence of one event affects the probability of the other event.	**sucesos dependientes** Dos sucesos son dependientes si el hecho de que uno de ellos ocurra o no afecta la probabilidad del otro suceso.	From a bag containing 3 red marbles and 2 blue marbles, draw a red marble, and then draw a blue marble without replacing the first marble.
dependent system A system of equations that has infinitely many solutions.	**sistema dependiente** Sistema de ecuaciones que tiene infinitamente muchas soluciones.	$\begin{cases} x + y = 2 \\ 2x + 2y = 4 \end{cases}$
dependent variable The output of a function; a variable whose value depends on the value of the input, or independent variable.	**variable dependiente** Salida de una función; variable cuyo valor depende del valor de la entrada, o variable independiente.	For $y = 2x + 1$, y is the dependent variable. input: x output: y
diameter A segment that has endpoints on the circle and that passes through the center of the circle; also the length of that segment.	**diámetro** Segmento que atraviesa el centro de un círculo y cuyos extremos están sobre la circunferencia; longitud de dicho segmento.	
difference of two cubes A polynomial of the form $a^3 - b^3$, which may be written as the product $(a - b)(a^2 + ab + b^2)$.	**diferencia de dos cubos** Polinomio del tipo $a^3 - b^3$, que se puede expresar como el producto $(a - b)(a^2 + ab + b^2)$.	$x^3 - 8 = (x - 2)(x^2 + 2x + 4)$
difference of two squares A polynomial of the form $a^2 - b^2$, which may be written as the product $(a + b)(a - b)$.	**diferencia de dos cuadrados** Polinomio del tipo $a^2 - b^2$, que se puede expresar como el producto $(a + b)(a - b)$.	$x^2 - 4 = (x + 2)(x - 2)$

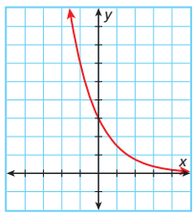
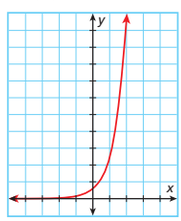
Glossary/Glosario **G9**

ENGLISH	SPANISH	EXAMPLES
dimensional analysis A process that uses rates to convert measurements from one unit to another.	**análisis dimensional** Un proceso que utiliza tasas para convertir medidas de unidad a otra.	$12 \text{ pt} \cdot \frac{1 \text{ qt}}{2 \text{ pt}} = 6 \text{ qt}$
direct variation A linear relationship between two variables, x and y, that can be written in the form $y = kx$, where k is a nonzero constant.	**variación directa** Relación lineal entre dos variables, x e y, que puede expresarse en la forma $y = kx$, donde k es una constante distinta de cero.	 $y = 2x$
discontinuous function A function whose graph has one or more jumps, breaks, or holes.	**función discontinua** Función cuya gráfica tiene uno o más saltos, interrupciones u hoyos.	
discount An amount by which an original price is reduced.	**descuento** Cantidad por la que se reduce un precio original.	
discrete graph A graph made up of unconnected points.	**gráfica discreta** Gráfica compuesta de puntos no conectados.	
discriminant The discriminant of the quadratic equation $ax^2 + bx + c = 0$ is $b^2 - 4ac$.	**discriminante** El discriminante de la ecuación cuadrática $ax^2 + bx + c = 0$ es $b^2 - 4ac$.	The discriminant of $2x^2 - 5x - 3 = 0$ is $(-5)^2 - 4(2)(-3)$ or 49.
Distance Formula In a coordinate plane, the distance from (x_1, y_1) to (x_2, y_2) is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.	**Fórmula de distancia** En un plano cartesiano, la distancia desde (x_1, y_1) hasta (x_2, y_2) es $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.	 The distance from $(2, 5)$ to $(-1, 1)$ is $d = \sqrt{(-1 - 2)^2 + (1 - 5)^2}$ $= \sqrt{(-3)^2 + (-4)^2}$ $= \sqrt{9 + 16} = \sqrt{25} = 5$.
Distributive Property For all real numbers a, b, and c, $a(b + c) = ab + ac$, and $(b + c)a = ba + ca$.	**Propiedad distributiva** Dados los números reales a, b y c, $a(b + c) = ab + ac$, y $(b + c)a = ba + ca$.	$3(4 + 5) = 3 \cdot 4 + 3 \cdot 5$ $(4 + 5)3 = 4 \cdot 3 + 5 \cdot 3$
Division Property of Equality For real numbers a, b,and c, where $c \neq 0$, if $a = b$,then $\frac{a}{c} = \frac{b}{c}$.	**Propiedad de igualdad de la división** Dados los números reales a, b y c, donde $c \neq 0$, si $a = b$, entonces $\frac{a}{c} = \frac{b}{c}$.	$4x = 12$ $\frac{4x}{4} = \frac{12}{4}$ $x = 3$

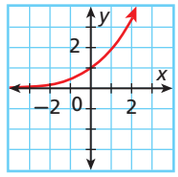
G10 *Glossary/Glosario*

ENGLISH	SPANISH	EXAMPLES
Division Property of Inequality If both sides of an inequality are divided by the same positive quantity, the new inequality will have the same solution set. If both sides of an inequality are divided by the same negative quantity, the new inequality will have the same solution set if the inequality symbol is reversed.	**Propiedad de desigualdad de la división** Cuando ambos lados de una desigualdad se dividen entre el mismo número positivo, la nueva desigualdad tiene el mismo conjunto solución. Cuando ambos lados de una desigualdad se dividen entra el mismo número negativo, la nueva desigualdad tiene el mismo conjunto solución si se invierte el símbolo de desigualdad.	$4x \geq 12$ $\frac{4x}{4} \geq \frac{12}{4}$ $x \geq 3$ $-4x \geq 12$ $\frac{-4x}{-4} \leq \frac{12}{-4}$ $x \leq -3$
domain The set of all first coordinates (or x-values) of a relation or function.	**dominio** Conjunto de todos los valores de la primera coordenada (o valores de x) de una función o relación.	The domain of the function $\{(-5, 3), (-3, -2), (-1, -1), (1, 0)\}$ is $\{-5, -3, -1, 1\}$.
element Each member in a set or matrix. *See also* entry.	**elemento** Cada miembro en un conjunto o matriz. *Ver también* entrada.	
elimination method A method used to solve systems of equations in which one variable is eliminated by adding or subtracting two equations of the system.	**eliminación** Método utilizado para resolver sistemas de ecuaciones por el cual se elimina una variable sumando o restando dos ecuaciones del sistema.	
empty set A set with no elements.	**conjunto vacío** Conjunto sin elementos.	The solution set of $\lvert x \rvert < 0$ is the empty set, $\{\ \}$, or $\varnothing$.
entry Each value in a matrix; also called an element.	**entrada** Cada valor de una matriz, también denominado elemento.	3 is the entry in the first row and second column of $A = \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix}$, denoted a_{12}.
equally likely outcomes Outcomes are equally likely if they have the same probability of occurring. If an experiment has n equally likely outcomes, then the probability of each outcome is $\frac{1}{n}$.	**resultados igualmente probables** Los resultados son igualmente probables si tienen la misma probabilidad de ocurrir. Si un experimento tiene n resultados igualmente probables, entonces la probabilidad de cada resultado es $\frac{1}{n}$.	If a fair coin is tossed, then $P(\text{heads}) = P(\text{tails}) = \frac{1}{2}$. So the outcome "heads" and the outcome "tails" are equally likely.
equation A mathematical statement that two expressions are equivalent.	**ecuación** Enunciado matemático que indica que dos expresiones son equivalentes.	$x + 4 = 7$ $2 + 3 = 6 - 1$ $(x - 1)^2 + (y + 2)^2 = 4$
equilateral triangle A triangle with three congruent sides.	**triángulo equilátero** Triángulo con tres lados congruentes.	
equivalent ratios Ratios that name the same comparison.	**razones equivalentes** Razones que expresan la misma comparación.	$\frac{1}{2}$ and $\frac{2}{4}$ are equivalent ratios.

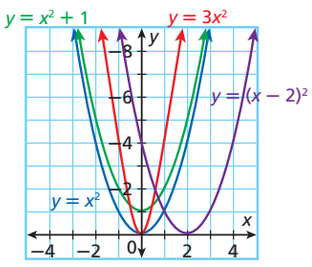
Glossary/Glosario **G11**

ENGLISH	SPANISH	EXAMPLES
evaluate To find the value of an algebraic expression by substituting a number for each variable and simplifying by using the order of operations.	**evaluar** Calcular el valor de una expresión algebraica sustituyendo cada variable por un número y simplificando mediante el orden de las operaciones.	Evaluate $2x + 7$ for $x = 3$. $2x + 7$ $2(3) + 7$ $6 + 7$ 13
event An outcome or set of outcomes of an experiment.	**suceso** Resultado o conjunto de resultados en un experimento.	In the experiment of rolling a number cube, the event "an odd number" consists of the outcomes 1, 3, and 5.
excluded values Values of x for which a function or expression is not defined.	**valores excluidos** Valores de x para los cuales no está definida una función o expresión.	The excluded values of $\frac{(x+2)}{(x-1)(x+4)}$ are $x = 1$ and $x = -4$, which would make the denominator equal to 0.
experiment An operation, process, or activity in which outcomes can be used to estimate probability.	**experimento** Una operación, proceso o actividad en la que se usan los resultados para estimar una probabilidad.	Tossing a coin 10 times and noting the number of heads
experimental probability The ratio of the number of times an event occurs to the number of trials, or times, that an activity is performed.	**probabilidad experimental** Razón entre la cantidad de veces que ocurre un suceso y la cantidad de pruebas, o veces, que se realiza una actividad.	Kendra attempted 27 free throws and made 16 of them. The experimental probability that she will make her next free throw is $P(\text{free throw}) = \frac{\text{number made}}{\text{number attempted}} = \frac{16}{27} \approx 0.59$.
exponent The number that indicates how many times the base in a power is used as a factor.	**exponente** Número que indica la cantidad de veces que la base de una potencia se utiliza como factor.	$3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$ 4 is the exponent.
exponential decay An exponential function of the form $f(x) = ab^x$ in which $0 < b < 1$. If r is the rate of decay, then the function can be written $y = a(1 - r)^t$, where a is the initial amount and t is the time.	**decremento exponencial** Función exponencial del tipo $f(x) = ab^x$ en la cual $0 < b < 1$. Si r es la tasa decremental, entonces la función se puede expresar como $y = a(1 - r)^t$, donde a es la cantidad inicial y t es el tiempo.	$f(x) = 3\left(\frac{1}{2}\right)^x$ 
exponential expression An algebraic expression in which the variable is in an exponent with a fixed number as the base.	**expresión exponencial** Expresión algebraica en la que la variable está en un exponente y que tiene un número fijo como base.	2^{x+1}
exponential function A function of the form $f(x) = ab^x$, where a and b are real numbers with $a \neq 0$, $b > 0$, and $b \neq 1$.	**función exponencial** Función del tipo $f(x) = ab^x$, donde a y b son números reales con $a \neq 0$, $b > 0$ y $b \neq 1$.	$f(x) = 3 \cdot 4^x$ 

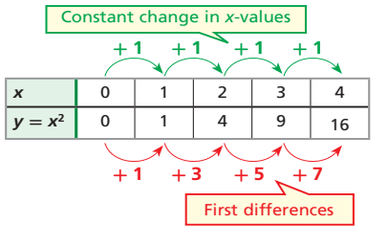
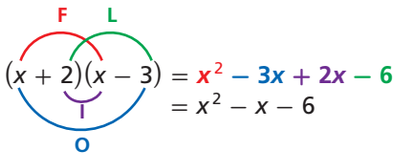
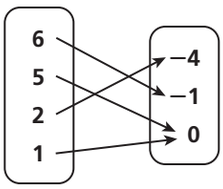
G12 *Glossary/Glosario*

ENGLISH	SPANISH	EXAMPLES
exponential growth An exponential function of the form $f(x) = ab^x$ in which $b > 1$. If r is the rate of growth, then the function can be written $y = a(1 + r)^t$, where a is the initial amount and t is the time.	**crecimiento exponencial** Función exponencial del tipo $f(x) = ab^x$ en la que $b > 1$. Si r es la tasa de crecimiento, entonces la función se puede expresar como $y = a(1 + r)^t$, donde a es la cantidad inicial y t es el tiempo.	$f(x) = 2^x$ 
expression A mathematical phrase that contains operations, numbers, and/or variables.	**expresión** Frase matemática que contiene operaciones, números y/o variables.	$6x + 1$
extraneous solution A solution of a derived equation that is not a solution of the original equation.	**solución extraña** Solución de una ecuación derivada que no es una solución de la ecuación original.	To solve $\sqrt{x} = -2$, square both sides; $x = 4$. ***Check*** $\sqrt{4} = -2$ is false; so 4 is an extraneous solution.

F

factor A number or expression that is multiplied by another number or expression to get a product. *See also* factoring.	**factor** Número o expresión que se multiplica por otro número o expresión para obtener un producto. *Ver también* factoreo.	$12 = 3 \cdot 4$ 3 and 4 are factors of 12. $x^2 - 1 = (x - 1)(x + 1)$ $(x - 1)$ and $(x + 1)$ are factors of $x^2 - 1$.
factorial If n is a positive integer, then n factorial, written $n!$, is $n \cdot (n - 1) \cdot (n - 2) \cdot \ldots \cdot 2 \cdot 1$. The factorial of 0 is defined to be 1.	**factorial** Si n es un entero positivo, entonces el factorial de n, expresado como $n!$, es $n \cdot (n - 1) \cdot (n - 2) \cdot \ldots \cdot 2 \cdot 1$. Por definición, el factorial de 0 será 1.	$7! = 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ $= 5040$
factoring The process of writing a number or algebraic expression as a product.	**factorización** Proceso por el que se expresa un número o expresión algebraica como un producto.	$x^2 - 4x - 21 = (x - 7)(x + 3)$
fair When all outcomes of an experiment are equally likely.	**justo** Cuando todos los resultados de un experimento son igualmente probables.	When tossing a fair coin, heads and tails are equally likely. Each has a probability of $\frac{1}{2}$.
family of functions A set of functions whose graphs have basic characteristics in common. Functions in the same family are transformations of their parent function.	**familia de funciones** Conjunto de funciones cuyas gráficas tienen características básicas en común. Las funciones de la misma familia son transformaciones de su función madre.	

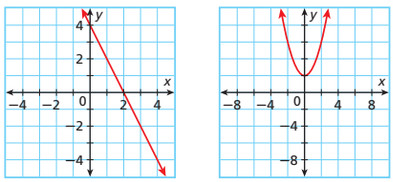
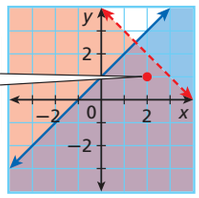
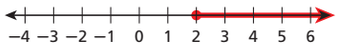
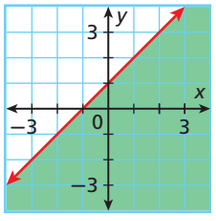
Glossary/Glosario **G13**

ENGLISH	SPANISH	EXAMPLES
first differences The differences between *y*-values of a function for evenly spaced *x*-values.	**primeras diferencias** Diferencias entre los valores de *y* de una función para valores de *x* espaciados uniformemente.	
first quartile The median of the lower half of a data set, denoted Q_1. Also called *lower quartile*.	**primer cuartil** Mediana de la mitad inferior de un conjunto de datos, expresada como Q_1. También se llama *cuartil inferior*.	**Lower half** **Upper half** 18, 23, 28, 29, 36, 42 **First quartile**
FOIL A mnemonic (memory) device for a method of multiplying two binomials: Multiply the **First** terms. Multiply the **Outer** terms. Multiply the **Inner** terms. Multiply the **Last** terms.	**FOIL** Regla mnemotécnica para recordar el método de multiplicación de dos binomios: Multiplicar los términos **Primeros** (***First***). Multiplicar los términos **Externos** (***Outer***). Multiplicar los términos **Internos** (***Inner***). Multiplicar los términos **Últimos** (***Last***).	
formula A literal equation that states a rule for a relationship among quantities.	**fórmula** Ecuación literal que establece una regla para una relación entre cantidades.	$A = \pi r^2$
fractional exponent *See* rational exponent.	**exponente fraccionario** *Ver* exponente racional.	
frequency The number of times the value appears in the data set.	**frecuencia** Cantidad de veces que aparece el valor en un conjunto de datos.	In the data set 5, 6, 6, 7, 8, 9, the data value 6 has a frequency of 2.
frequency table A table that lists the number of times, or frequency, that each data value occurs.	**tabla de frecuencia** Tabla que enumera la cantidad de veces que ocurre cada valor de datos, o la frecuencia.	Data set: 1, 1, 2, 2, 3, 4, 5, 5, 5, 6, 6, 6, 6 Frequency table: Data | Frequency 1 | 2 2 | 2 3 | 1 4 | 1 5 | 3 6 | 4
function A relation in which every domain value is paired with exactly one range value.	**función** Relación en la que a cada valor de dominio corresponde exactamente un valor de rango.	

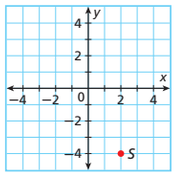
G14 *Glossary/Glosario*

ENGLISH	SPANISH	EXAMPLES
function notation If x is the independent variable and y is the dependent variable, then the function notation for y is $f(x)$, read "f of x," where f names the function.	**notación de función** Si x es la variable independiente e y es la variable dependiente, entonces la notación de función para y es $f(x)$, que se lee "f de x," donde f nombra la función.	equation: $y = 2x$ function notation: $f(x) = 2x$
function rule An algebraic expression that defines a function.	**regla de función** Expresión algebraica que define una función.	$f(x) = \underbrace{2x^2 + 3x - 7}_{\text{function rule}}$
Fundamental Counting Principle If one event has m possible outcomes and a second event has n possible outcomes after the first event has occurred, then there are mn total possible outcomes for the two events.	**Principio fundamental de conteo** Si un suceso tiene m resultados posibles y otro suceso tiene n resultados posibles después de ocurrido el primer suceso, entonces hay mn resultados posibles en total para los dos sucesos.	If there are 4 colors of shirts, 3 colors of pants, and 2 colors of shoes, then there are $4 \cdot 3 \cdot 2 = 24$ possible outfits.

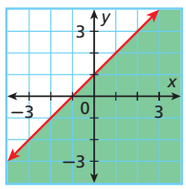
G

geometric sequence A sequence in which the ratio of successive terms is a constant r, called the common ratio, where $r \neq 0$ and $r \neq 1$.	**sucesión geométrica** Sucesión en la que la razón de los términos sucesivos es una constante r, denominada razón común, donde $r \neq 0$ y $r \neq 1$.	1, 2, 4, 8, 16, … $\cdot 2 \cdot 2 \cdot 2 \cdot 2$ $r = 2$
graph of a function The set of points in a coordinate plane with coordinates (x, y), where x is in the domain of the function f and $y = f(x)$.	**gráfica de una función** Conjunto de los puntos de un plano cartesiano con coordenadas (x, y), donde x está en el dominio de la función f e $y = f(x)$.	
graph of a system of linear inequalities The region in a coordinate plane consisting of points whose coordinates are solutions to all of the inequalities in the system.	**gráfica de un sistema de desigualdades lineales** Región de un plano cartesiano que consta de puntos cuyas coordenadas son soluciones de todas las desigualdades del sistema.	(2, 1) is in the overlapping shaded regions, so it is a solution. 
graph of an inequality in one variable The set of points on a number line that are solutions of the inequality.	**gráfica de una desigualdad en una variable** Conjunto de los puntos de una recta numérica que representan soluciones de la desigualdad.	$x \geq 2$ 
graph of an inequality in two variables The set of points in a coordinate plane whose coordinates (x, y) are solutions of the inequality.	**gráfica de una desigualdad en dos variables** Conjunto de los puntos de un plano cartesiano cuyas coordenadas (x, y) son soluciones de la desigualdad.	$y \leq x + 1$ 

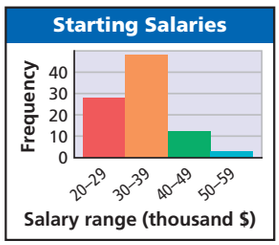
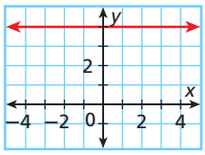
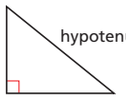
Glossary/Glosario **G15**

ENGLISH	SPANISH	EXAMPLES
graph of an ordered pair For the ordered pair (x, y), the point in a coordinate plane that is a horizontal distance of x units from the origin and a vertical distance of y units from the origin.	**gráfica de un par ordenado** Dado el par ordenado (x, y), punto en un plano cartesiano que está a una distancia horizontal de x unidades desde el origen y a una distancia vertical de y unidades desde el origen.	 $S(2, -4)$
greatest common factor (monomials) (GCF) The product of the greatest integer and the greatest power of each variable that divide evenly into each monomial.	**máximo común divisor (monomios) (MCD)** Producto del entero mayor y la potencia mayor de cada variable que divide exactamente cada monomio.	The GCF of $4x^3y$ and $6x^2y$ is $2x^2y$.
greatest common factor (numbers) (GCF) The largest common factor of two or more given numbers.	**máximo común divisor (números) (MCD)** El mayor de los factores comunes compartidos por dos o más números dados.	The GCF of 27 and 45 is 9.
grouping symbols Symbols such as parentheses ( ), brackets [ ], and braces { } that separate part of an expression. A fraction bar, absolute-value symbols, and radical symbols may also be used as grouping symbols.	**símbolos de agrupación** Símbolos tales como paréntesis ( ), corchetes [ ] y llaves { } que separan parte de una expresión. La barra de fracciones, los símbolos de valor absoluto y los símbolos de radical también se pueden utilizar como símbolos de agrupación.	$6 + \{3 - [(4 - 3) + 2] + 1\} - 5$ $6 + \{3 - [1 + 2] + 1\} - 5$ $6 + \{3 - 3 + 1\} - 5$ $6 + 1 - 5$ 2

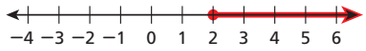
H

half-life The half-life of a substance is the time it takes for one-half of the substance to decay into another substance.	**vida media** La vida media de una sustancia es el tiempo que tarda la mitad de la sustancia en desintegrarse y transformarse en otra sustancia.	Carbon-14 has a half-life of 5730 years, so 5 g of an initial amount of 10 g will remain after 5730 years.
half-plane The part of the coordinate plane on one side of a line, which may include the line.	**semiplano** La parte del plano cartesiano de un lado de una línea, que puede incluir la línea.	
Heron's Formula Atriangle with side lengths a, b, and c has area $A = \sqrt{s(s-a)(s-b)(s-c)}$, where s is one-half the perimeter, or $s = \frac{1}{2}(a + b + c)$.	**fórmula de Herón** Un triángulo con longitudes de lado a, b y c tiene un área $A = \sqrt{s(s-a)(s-b)(s-c)}$, donde s es la mitad del perímetro ó $s = \frac{1}{2}(a + b + c)$.	

G16 Glossary/Glosario

ENGLISH	SPANISH	EXAMPLES
histogram A bar graph used to display data grouped in intervals.	**histograma** Gráfica de barras utilizada para mostrar datos agrupados en intervalos de clases.	
horizontal line A line described by the equation $y = b$, where b is the y-intercept.	**línea horizontal** Línea descrita por la ecuación $y = b$, donde b es la intersección con el eje y.	$y = 4$ 
hypotenuse The side opposite the right angle in a right triangle.	**hipotenusa** Lado opuesto al ángulo recto de un triángulo rectángulo.	
I		
identity An equation that is true for all values of the variables.	**identidad** Ecuación verdadera para todos los valores de las variables.	$3 = 3$ $2(x - 1) = 2x - 2$
inclusive events Events that have one or more outcomes in common.	**sucesos inclusivos** Sucesos que tienen uno o más resultados en común.	In the experiment of rolling a number cube, rolling an even number and rolling a number less than 3 are inclusive events because both contain the outcome 2.
inconsistent system A system of equations or inequalities that has no solution.	**sistema inconsistente** Sistema de ecuaciones o desigualdades que no tiene solución.	$\begin{cases} x + y = 0 \\ x + y = 1 \end{cases}$
independent events Events for which the occurrence or nonoccurrence of one event does not affect the probability of the other event.	**sucesos independientes** Dos sucesos son independientes si el hecho de que se produzca o no uno de ellos no afecta la probabilidad del otro suceso.	From a bag containing 3 red marbles and 2 blue marbles, draw a red marble, replace it, and then draw a blue marble.
independent system A system of equations that has exactly one solution.	**sistema independiente** Sistema de ecuaciones que tiene sólo una solución.	$\begin{cases} x + y = 7 \\ x - y = 1 \end{cases}$ Solution: $(4, 3)$
independent variable The input of a function; a variable whose value determines the value of the output, or dependent variable.	**variable independiente** Entrada de una función; variable cuyo valor determina el valor de la salida, o variable dependiente.	For $y = 2x + 1$, x is the independent variable.

Glossary/Glosario **G17**

ENGLISH	SPANISH	EXAMPLES
index In the radical $\sqrt[n]{x}$, which represents the nth root of x, n is the index. In the radical $\sqrt{x}$, the index is understood to be 2.	**índice** En el radical $\sqrt[n]{x}$, que representa la enésima raíz de x, n es el índice. En el radical $\sqrt{x}$, se da por sentado que el índice es 2.	The radical $\sqrt[3]{8}$ has an index of 3.
indirect measurement A method of measurement that uses formulas, similar figures, and/or proportions.	**medición indirecta** Método de medición en el que se usan fórmulas, figuras semejantes y/o proporciones.	
inequality A statement that compares two expressions by using one of the following signs: $<$, $>$, $\leq$, $\geq$, or $\neq$.	**desigualdad** Enunciado que compara dos expresiones utilizando uno de los siguientes signos: $<$, $>$, $\leq$, $\geq$, o $\neq$.	$x \geq 2$ 
input A value that is substituted for the independent variable in a relation or function.	**entrada** Valor que sustituye a la variable independiente en una relación o función.	For the function $f(x) = x + 5$, the input 3 produces an output of 8.
input-output table A table that displays input values of a function or expression together with the corresponding outputs.	**tabla de entrada y salida** Tabla que muestra los valores de entrada de una función o expresión junto con las correspondientes salidas.	Input x: 1, 2, 3, 4 Output y: 4, 7, 10, 13
integer A member of the set of whole numbers and their opposites.	**entero** Miembro del conjunto de números cabales y sus opuestos.	…, −3, −2, −1, 0, 1, 2, 3, …
intercept *See* x-intercept and y-intercept.	**intersección** *Ver* intersección con el eje x e intersección con el eje y.	
interest The amount of money charged for borrowing money or the amount of money earned when saving or investing money. *See also* compound interest, simple interest.	**interés** Cantidad de dinero que se cobra por prestar dinero o cantidad de dinero que se gana cuando se ahorra o invierte dinero. *Ver también* interés compuesto, interés simple.	
interquartile range (IQR) The difference of the third (upper) and first (lower) quartiles in a data set, representing the middle half of the data.	**rango entre cuartiles** Diferencia entre el tercer cuartil (superior) y el primer cuartil (inferior) de un conjunto de datos, que representa la mitad central de los datos.	Lower half | Upper half 18, 23, 28, | 29, 36, 42 First quartile, Third quartile Interquartile range: $36 - 23 = 13$
intersection The intersection of two sets is the set of all elements that are common to both sets, denoted by ∩.	**intersección de conjuntos** La intersección de dos conjuntos es el conjunto de todos los elementos que son comunes a ambos conjuntos, expresado por ∩.	$A = \{1, 2, 3, 4\}$ $B = \{1, 3, 5, 7, 9\}$ $A \cap B = \{1, 3\}$
inverse operations Operations that undo each other.	**operaciones inversas** Operaciones que se anulan entre sí.	Addition and subtraction of the same quantity are inverse operations: $5 + 3 = 8$, $8 - 3 = 5$ Multiplication and division by the same quantity are inverse operations: $2 \cdot 3 = 6$, $6 \div 3 = 2$

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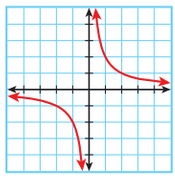
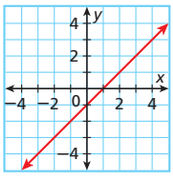
ENGLISH	SPANISH	EXAMPLES
inverse variation A relationship between two variables, x and y, that can be written in the form $y = \frac{k}{x}$, where k is a nonzero constant and $x \neq 0$.	**variación inversa** Relación entre dos variables, x e y, que puede expresarse en la forma $y = \frac{k}{x}$, donde k es una constante distinta de cero y $x \neq 0$.	$y = \frac{8}{x}$ 
irrational number A real number that cannot be expressed as the ratio of two integers.	**número irracional** Número real que no se puede expresar como una razón de enteros.	$\sqrt{2}$, π, e
isolate the variable To isolate a variable in an equation, use inverse operations on both sides until the variable appears by itself on one side of the equation and does not appear on the other side.	**despejar la variable** Para despejar la variable de una ecuación, utiliza operaciones inversas en ambos lados hasta que la variable aparezca sola en uno de los lados de la ecuación y no aparezca en el otro lado.	$10 = 6 - 2x$ $\frac{-6}{4} = \frac{-6}{-2x}$ $\frac{4}{-2} = \frac{-2x}{-2}$ $-2 = x$
isosceles triangle A triangle with at least two congruent sides.	**triángulo isósceles** Triángulo que tiene al menos dos lados congruentes.	

L

leading coefficient The coefficient of the first term of a polynomial in standard form.	**coeficiente principal** Coeficiente del primer término de un polinomio en forma estándar.	$3x^2 + 7x - 2$ Leading coefficient: 3
least common denominator (LCD) The least common multiple of the denominators of two or more given fractions or rational expressions.	**mínimo común denominador (MCD)** Mínimo común múltiplo de los denominadores de dos o más fracciones dadas o expresionnes racionales.	The LCD of $\frac{3}{4}$ and $\frac{5}{6}$ is 12.
least common multiple (monomials) (LCM) The product of the smallest positive number and the lowest power of each variable that divide evenly into each monomial.	**mínimo común múltiplo (monomios) (MCM)** El producto del número positivo más pequeño y la menor potencia de cada variable que divide exactamente cada monomio.	The LCM of $6x^2$ and $4x$ is $12x^2$.
least common multiple (numbers) (LCM) The smallest whole number, other than zero, that is a multiple of two or more given numbers.	**mínimo común múltiplo (números) (MCM)** El menor de los números cabales, distinto de cero, que es múltiplo de dos o más números dados.	The LCM of 10 and 18 is 90.
least-squares line The line of fit for which the sum of the squares of the residuals is as small as possible.	**línea de mínimos cuadrados** La línea de ajuste en que la suma de cuadrados de los residuos es la menor.	

Glossary/Glosario **G19**

ENGLISH	SPANISH	EXAMPLES
line graph A graph that uses line segments to show how data changes.	**gráfica lineal** Gráfica que se vale de segmentos de recta para mostrar cambios en los datos.	
line of best fit The line that comes closest to all of the points in a data set.	**línea de mejor ajuste** Línea que más se acerca a todos los puntos de un conjunto de datos.	
linear equation in one variable An equation that can be written in the form $ax = b$ where a and b are constants and $a \neq 0$.	**ecuación lineal en una variable** Ecuación que puede expresarse en la forma $ax = b$ donde a y b son constantes y $a \neq 0$.	$x + 1 = 7$
linear equation in two variables An equation that can be written in the form $Ax + By = C$ where A, B, and C are constants and A and B are not both 0.	**ecuación lineal en dos variables** Ecuación que puede expresarse en la forma $Ax + By = C$ donde A, B y C son constantes y A y B no son ambas 0.	$2x + 3y = 6$
linear function A function that can be written in the form $y = mx + b$, where x is the independent variable and m and b are real numbers. Its graph is a line.	**función lineal** Función que puede expresarse en la forma $y = mx + b$, donde x es la variable independiente y m y b son números reales. Su gráfica es una línea.	$y = x - 1$ 
linear inequality in one variable An inequality that can be written in one of the following forms: $ax < b$, $ax > b$, $ax \leq b$, $ax \geq b$, or $ax \neq b$, where a and b are constants and $a \neq 0$.	**desigualdad lineal en una variable** Desigualdad que puede expresarse de una de las siguientes formas: $ax < b$, $ax > b$, $ax \leq b$, $ax \geq b$ o $ax \neq b$, donde a y b son constantes y $a \neq 0$.	$3x - 5 \leq 2(x + 4)$
linear inequality in two variables An inequality that can be written in one of the following forms: $Ax + By < C$, $Ax + By > C$, $Ax + By \leq C$, $Ax + By \geq C$, or $Ax + By \neq C$, where A, B, and C are constants and A and B are not both 0.	**desigualdad lineal en dos variables** Desigualdad que puede expresarse de una de las siguientes formas: $Ax + By < C$, $Ax + By > C$, $Ax + By \leq C$, $Ax + By \geq C$ o $Ax + By \neq C$, donde A, B y C son constantes y A y B no son ambas 0.	$2x + 3y > 6$
linear regression A statistical method used to fit a linear model to a given data set.	**regresión lineal** Método estadístico utilizado para ajustar un modelo lineal a un conjunto de datos determinado.	

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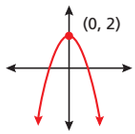
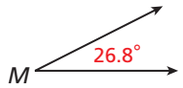
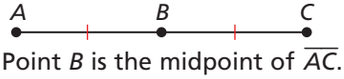
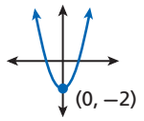
ENGLISH	SPANISH	EXAMPLES
literal equation An equation that contains two or more variables.	**ecuación literal** Ecuación que contiene dos o más variables.	$d = rt$ $A = \frac{1}{2}h(b_1 + b_2)$
lower quartile *See* first quartile.	**cuartil inferior** *Ver* primer cuartil.	

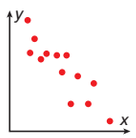
M

mapping diagram A diagram that shows the relationship of elements in the domain to elements in the range of a relation or function.	**diagrama de correspondencia** Diagrama que muestra la relación entre los elementos del dominio y los elementos del rango de una función.	**Mapping Diagram** Domain Range 2 → A, B, C
markup The amount by which a wholesale cost is increased.	**margen de ganancia** Cantidad que se agrega a un costo mayorista.	
matrix A rectangular array of numbers.	**matriz** Arreglo rectangular de números.	$\begin{bmatrix} 1 & 0 & 3 \\ -2 & 2 & -5 \\ 7 & -6 & 3 \end{bmatrix}$
maximum of a function The y-value of the highest point on the graph of the function.	**máximo de una función** Valor de y del punto más alto en la gráfica de la función.	 The maximum of the function is 2.
mean The sum of all the values in a data set divided by the number of data values. Also called the *average*.	**media** Suma de todos los valores de un conjunto de datos dividida entre el número de valores de datos. También llamada *promedio*.	Data set: 4, 6, 7, 8, 10 Mean: $\frac{4 + 6 + 7 + 8 + 10}{5}$ $= \frac{35}{5} = 7$
measure of an angle Angles are measured in degrees. A degree is $\frac{1}{360}$ of a complete circle.	**medida de un ángulo** Los ángulos se miden en grados. Un grado es $\frac{1}{360}$ de un círculo completo.	
measure of central tendency A measure that describes the center of a data set.	**medida de tendencia dominante** Medida que describe el centro de un conjunto de datos.	mean, median, or mode
median For an ordered data set with an odd number of values, the median is the middle value. For an ordered data set with an even number of values, the median is the average of the two middle values.	**mediana** Dado un conjunto de datos ordenado con un número impar de valores, la mediana es el valor medio. Dado un conjunto de datos con un número par de valores, la mediana es el promedio de los dos valores medios.	8, 9, (9), 12, 15 Median: 9 4, 6, (7, 10), 10, 12 Median: $\frac{7 + 10}{2} = 8.5$
midpoint The point that divides a segment into two congruent segments.	**punto medio** Punto que divide un segmento en dos segmentos congruentes.	 Point B is the midpoint of $\overline{AC}$.

Glossary/Glossario **G21**

ENGLISH	SPANISH	EXAMPLES
minimum of a function The y-value of the lowest point on the graph of the function.	**mínimo de una función** Valor de y del punto más bajo en la gráfica de la función.	 The minimum of the function is −2.
mode The value or values that occur most frequently in a data set; if all values occur with the same frequency, the data set is said to have no mode.	**moda** El valor o los valores que se presentan con mayor frecuencia en un conjunto de datos. Si todos los valores se presentan con la misma frecuencia, se dice que el conjunto de datos no tiene moda.	Data set: 3, 6, 8, 8, 10 Mode: 8 Data set: 2, 5, 5, 7, 7 Modes: 5 and 7 Data set: 2, 3, 6, 9, 11 No mode
monomial A number or a product of numbers and variables with whole-number exponents, or a polynomial with one term.	**monomio** Número o producto de números y variables con exponentes de números cabales, o polinomio con un término.	$3x^2y^4$
Multiplication Property of Equality If a, b, and c are real numbers and $a = b$, then $ac = bc$.	**Propiedad de igualdad de la multiplicación** Si a, b y c son números reales y $a = b$, entonces $ac = bc$.	$\frac{1}{3}x = 7$ $(3)\left(\frac{1}{3}x\right) = (3)(7)$ $x = 21$
Multiplication Property of Inequality If both sides of an inequality are multiplied by the same positive quantity, the new inequality will have the same solution set. If both sides of an inequality are multiplied by the same negative quantity, the new inequality will have the same solution set if the inequality symbol is reversed.	**Propiedad de desigualdad de la multiplicación** Si ambos lados de una desigualdad se multiplican por el mismo número positivo, la nueva desigualdad tendrá el mismo conjunto solución. Si ambos lados de una desigualdad se multiplican por el mismo número negativo, la nueva desigualdad tendrá el mismo conjunto solución si se invierte el símbolo de desigualdad.	$\frac{1}{3}x > 7$ $(3)\left(\frac{1}{3}x\right) > (3)(7)$ $x > 21$ $-x \le 2$ $(-1)(-x) \ge (-1)(2)$ $x \ge -2$
multiplicative inverse The reciprocal of the number.	**inverso multiplicativo** Recíproco de un número.	The multiplicative inverse of 5 is $\frac{1}{5}$.
mutually exclusive events Two events are mutually exclusive if they cannot both occur in the same trial of an experiment.	**sucesos mutuamente excluyentes** Dos sucesos son mutuamente excluyentes si ambos no pueden ocurrir en la misma prueba de un experimento.	In the experiment of rolling a number cube, rolling a 3 and rolling an even number are mutually exclusive events.

N

natural number A counting number.	**número natural** Número que se utiliza para contar.	1, 2, 3, 4, 5, 6, …
negative correlation Two data sets have a negative correlation if one set of data values increases as the other set decreases.	**correlación negativa** Dos conjuntos de datos tienen una correlación negativa si un conjunto de valores de datos aumenta a medida que el otro conjunto disminuye.	

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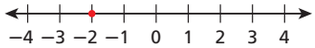
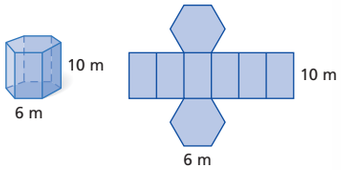
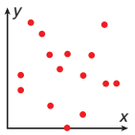
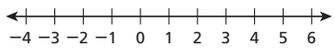
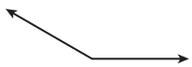
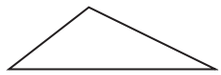
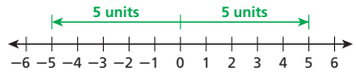
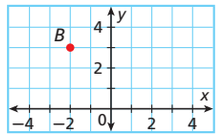
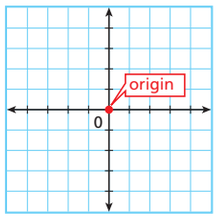
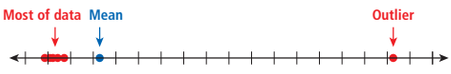
ENGLISH	SPANISH	EXAMPLES
negative exponent For any nonzero real number x and any integer n, $x^{-n} = \frac{1}{x^n}$.	**exponente negativo** Para cualquier número real distinto de cero x y cualquier entero n, $x^{-n} = \frac{1}{x^n}$.	$x^{-2} = \frac{1}{x^2}$; $3^{-2} = \frac{1}{3^2}$
negative number A number that is less than zero. Negative numbers lie to the left of zero on a number line.	**número negativo** Número menor que cero. Los números negativos se ubican a la izquierda del cero en una recta numérica.	−2 is a negative number. 
net A diagram of the faces of a three-dimensional figure arranged in such a way that the diagram can be folded to form the three-dimensional figure.	**plantilla** Diagrama de las caras de una figura tridimensional que se puede plegar para formar la figura tridimensional.	
no correlation Two data sets have no correlation if there is no relationship between the sets of values.	**sin correlación** Dos conjuntos de datos no tienen correlación si no existe una relación entre los conjuntos de valores.	
nonlinear system of equations A system in which at least one of the equations is not linear.	**sistema no lineal de ecuaciones** Sistema en el cual por lo menos una de las ecuaciones no es lineal.	A system that contains one quadratic equation and one linear equation is a nonlinear system.
***n*th root** The nth root of a number a, written as $\sqrt[n]{a}$ or $a^{\frac{1}{n}}$, is a number that is equal to a when it is raised to the nth power.	**enésima raíz** La enésima raíz de un número a, que se escribe $\sqrt[n]{a}$ o $a^{\frac{1}{n}}$, es un número igual a a cuando se eleva a la enésima potencia.	$\sqrt[5]{32} = 2$, because $2^5 = 32$.
number line A line used to represent the real numbers.	**recta numérica** Línea utilizada para representar los números reales.	

O

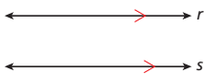
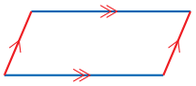
obtuse angle An angle that measures greater than 90° and less than 180°.	**ángulo obtuso** Ángulo que mide más de 90° y menos de 180°.	
obtuse triangle A triangle with one obtuse angle.	**triángulo obtusángulo** Triángulo con un ángulo obtuso.	
odds A comparison of favorable and unfavorable outcomes. The odds in favor of an event are the ratio of the number of favorable outcomes to the number of unfavorable outcomes. The odds against an event are the ratio of the number of unfavorable outcomes to the number of favorable outcomes.	**probabilidades a favor y en contra** Comparación de los resultados favorables y desfavorables. Las probabilidades a favor de un suceso son la razón entre la cantidad de resultados favorables y la cantidad de resultados desfavorables. Las probabilidades en contra de un suceso son la razón entre la cantidad de resultados desfavorables y la cantidad de resultados favorables.	The odds in favor of rolling a 3 on a number cube are 1:5. The odds against rolling a 3 on a number cube are 5:1.

Glossary/Glosario

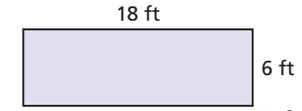
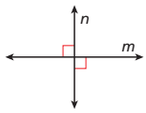
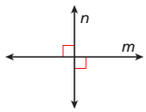
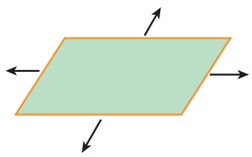
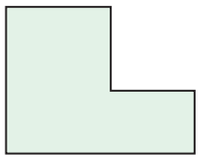
Glossary/Glosario **G23**

ENGLISH	SPANISH	EXAMPLES
opposite The opposite of a number a, denoted $-a$, is the number that is the same distance from zero as a, on the opposite side of the number line. The sum of opposites is 0.	**opuesto** El opuesto de un número a, expresado $-a$, es el número que se encuentra a la misma distancia de cero que a, del lado opuesto de la recta numérica. La suma de los opuestos es 0.	 5 and −5 are opposites.
opposite reciprocal The opposite of the reciprocal of a number. The opposite reciprocal of any nonzero number a is $-\frac{1}{a}$.	**recíproco opuesto** Opuesto del recíproco de un número. El recíproco opuesto de a es $-\frac{1}{a}$.	The opposite reciprocal of $\frac{2}{3}$ is $-\frac{3}{2}$.
OR A logical operator representing the union of two sets.	**O** Operador lógico que representa la unión de dos conjuntos.	$A = \{2, 3, 4, 5\}$ $B = \{1, 3, 5, 7\}$ The set of values that are in A OR B is $A \cup B = \{1, 2, 3, 4, 5, 7\}$.
order of operations A process for evaluating expressions: First, perform operations in parentheses or other grouping symbols. Second, simplify powers and roots. Third, perform all multiplication and division from left to right. Fourth, perform all addition and subtraction from left to right.	**orden de las operaciones** Regla para evaluar las expresiones: Primero, realizar las operaciones entre paréntesis u otros símbolos de agrupación. Segundo, simplificar las potencias y las raíces. Tercero, realizar todas las multiplicaciones y divisiones de izquierda a derecha. Cuarto, realizar todas las sumas y restas de izquierda a derecha.	$2 + 3^2 - (7 + 5) \div 4 \cdot 3$ $2 + 3^2 - 12 \div 4 \cdot 3$ Add inside parentheses. $2 + 9 - 12 \div 4 \cdot 3$ Simplify the power. $2 + 9 - 3 \cdot 3$ Divide. $2 + 9 - 9$ Multiply. $11 - 9$ Add. 2 Subtract.
ordered pair A pair of numbers (x, y) that can be used to locate a point on a coordinate plane. The first number x indicates the distance to the left or right of the origin, and the second number y indicates the distance above or below the origin.	**par ordenado** Par de números (x, y) que se pueden utilizar para ubicar un punto en un plano cartesiano. El primer número, x, indica la distancia a la izquierda o derecha del origen y el segundo número, y, indica la distancia hacia arriba o hacia abajo del origen.	 The ordered pair $(-2, 3)$ can be used to locate B.
origin The intersection of the x- and y-axes in a coordinate plane. The coordinates of the origin are $(0, 0)$.	**origen** Intersección de los ejes x e y en un plano cartesiano. Las coordenadas de origen son $(0, 0)$.	
outcome A possible result of a probability experiment.	**resultado** Resultado posible de un experimento de probabilidad.	In the experiment of rolling a number cube, the possible outcomes are 1, 2, 3, 4, 5, and 6.
outlier A data value that is far removed from the rest of the data.	**valor extremo** Valor de datos que está muy alejado del resto de los datos.	
output The result of substituting a value for a variable in a function.	**salida** Resultado de la sustitución de una variable por un valor en una función.	For the function $f(x) = x^2 + 1$, the input 3 produces an output of 10.

G24 *Glossary/Glosario*

ENGLISH	SPANISH	EXAMPLES
P		
parabola The shape of the graph of a quadratic function.	**parábola** Forma de la gráfica de una función cuadrática.	
parallel lines Linesin the same plane that do not intersect.	**líneas paralelas** Líneas en el mismo plano que no se cruzan.	
parallelogram A quadrilateral with two pairs of parallel sides.	**paralelogramo** Cuadrilátero con dos pares de lados paralelos.	
parent function The simplest function with the defining characteristics of the family. Functions in the same family are transformations of their parent function.	**función madre** La función más básica que tiene las características distintivas de una familia. Las funciones de la misma familia son transformaciones de su función madre.	$f(x) = x^2$ is the parent function for $g(x) = x^2 + 4$ and $h(x) = (5x + 2)^2 - 3$.
Pascal's triangle A triangular arrangement of numbers in which every rowstarts and ends with 1 and each other number is the sum of the two numbers above it.	**triángulo de Pascal** Arreglo triangular de números en el cual cada fila comienza y termina con 1 y los demás números son la suma de los dos valores que están arriba de cada uno.	1 1 1 1 2 1 1 3 3 1 1 4 6 4 1
percent A ratio that compares a number to 100.	**porcentaje** Razón que compara un número con 100.	$\frac{17}{100} = 17\%$
percent change An increase or decrease given as a percent of the original amount. *See also* percent decrease, percent increase.	**porcentaje de cambio** Incremento o disminución dada como un porcentaje de la cantidad original. *Ver también* porcentaje de disminución, porcentaje de incremento.	
percent decrease A decrease given as a percent of the original amount.	**porcentaje de disminución** Disminución dada como un porcentaje de la cantidad original.	If an item that costs \$8.00 is marked down to \$6.00, the amount of the decrease is \$2.00, so the percent decrease is $\frac{2.00}{8.00} = 0.25 = 25\%$.
percent increase An increase given as a percent of the original amount.	**porcentaje de incremento** Incremento dado como un porcentaje de la cantidad original.	If an item's wholesale cost of \$8.00 is marked up to \$12.00, the amount of the increase is \$4.00, so the percent increase is $\frac{4.00}{8.00} = 0.5 = 50\%$.
perfect square A number whose positive square root is a whole number.	**cuadrado perfecto** Número cuya raíz cuadrada positiva es un número cabal.	36 is a perfect square because $\sqrt{36} = 6$.

Glossary/Glosario **G25**

ENGLISH	SPANISH	EXAMPLES
perfect-square trinomial A trinomial whose factored form is the square of a binomial. A perfect-square trinomial has the form $a^2 - 2ab + b^2 = (a - b)^2$ or $a^2 + 2ab + b^2 = (a + b)^2$.	**trinomio cuadrado perfecto** Trinomio cuya forma factorizada es el cuadrado de un binomio. Un trinomio cuadrado perfecto tiene la forma $a^2 - 2ab + b^2 = (a - b)^2$ o $a^2 + 2ab + b^2 = (a + b)^2$.	$x^2 + 6x + 9$ is a perfect-square trinomial, because $x^2 + 6x + 9 = (x + 3)^2$.
perimeter The sum of the side lengths of a closed plane figure.	**perímetro** Suma de las longitudes de los lados de una figura plana cerrada.	 Perimeter = 18 + 6 + 18 + 6 = 48 ft
permutation An arrangement of a group of objects in which order is important.	**permutación** Arreglo de un grupo de objetos en el cual el orden es importante.	For objects *A*, *B*, *C*, and *D*, there are 12 different permutations of 2 objects. *AB*, *AC*, *AD*, *BC*, *BD*, *CD* *BA*, *CA*, *DA*, *CB*, *DB*, *DC*
perpendicular Intersecting to form 90° angles.	**perpendicular** Que se cruza para formar ángulos de 90°.	
perpendicular lines Lines that intersect at 90° angles.	**líneas perpendiculares** Líneas que se cruzan en ángulos de 90°.	
plane A flat surface that has no thickness and extends forever.	**plano** Una superficie plana que no tiene grosor y se extiende infinitamente.	
point A location that has no size.	**punto** Ubicación exacta que no tiene ningún tamaño.	point *P*
point-slope form The point-slope form of a linear equation is $y - y_1 = m(x - x_1)$, where m is the slope and (x_1, y_1) is a point on the line.	**forma de punto y pendiente** La forma de punto y pendiente de una ecuación lineal es $y - y_1 = m(x - x_1)$, donde m es la pendiente y (x_1, y_1) es un punto en la línea.	$y - 3 = 2(x - 3)$
polygon A closed plane figure formed by three or more segments such that each segment intersects exactly two other segments only at their endpoints and no two segments with a common endpoint are collinear.	**polígono** Figura plana cerrada formada por tres o más segmentos tal que cada segmento se cruza únicamente con otros dos segmentos sólo en sus extremos y ningún segmento con un extremo común a otro es colineal con éste.	
polynomial A monomial or a sum or difference of monomials.	**polinomio** Monomio o suma o diferencia de monomios.	$2x^2 + 3xy - 7y^2$

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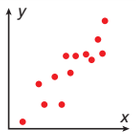
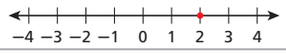
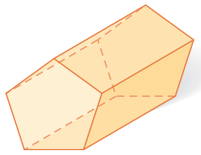
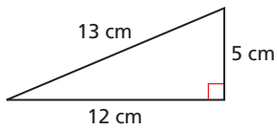
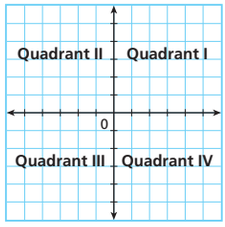
ENGLISH	SPANISH	EXAMPLES
polynomial long division A method of dividing one polynomial by another.	**división larga polinomial** Método por el que se divide un polinomio entre otro.	$$\begin{array}{r} x+1 \\ x+2\overline{)\,x^2+3x+5} \\ \underline{-(x^2+2x)} \\ x+5 \\ \underline{-(x+2)} \\ 3 \end{array}$$ $$\frac{x^2+3x+5}{x+2} = x+1+\frac{3}{x+2}$$
population The entire group of objects or individuals considered for a survey.	**población** Grupo completo de objetos o individuos que se desea estudiar.	In a survey about the study habits of high school students, the population is all high school students.
positive correlation Two data sets have a positive correlation if both sets of data values increase.	**correlación positiva** Dos conjuntos de datos tienen correlación positiva si los valores de ambos conjuntos de datos aumentan.	
positive number A number greater than zero.	**número positivo** Número mayor que cero.	2 is a positive number. 
Power of a Power Property If a is any nonzero real number and m and n are integers, then $(a^m)^n = a^{mn}$.	**Propiedad de la potencia de una potencia** Dado un número real a distinto de cero y los números enteros m y n, entonces $(a^m)^n = a^{mn}$.	$(6^7)^4 = 6^{7 \cdot 4}$ $= 6^{28}$
Power of a Product Property If a and b are any nonzero real numbers and n is any integer, then $(ab)^n = a^n b^n$.	**Propiedad de la potencia de un producto** Dados los números reales a y b distintos de cero y un número entero n, entonces $(ab)^n = a^n b^n$.	$(2 \cdot 4)^3 = 2^3 \cdot 4^3$ $= 8 \cdot 64$ $= 512$
Power of a Quotient Property If a and b are any nonzero real numbers and n is an integer, then $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$.	**Propiedad de la potencia de un cociente** Dados los números reales a y b distintos de cero y un número entero n, entonces $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$.	$\left(\frac{3}{5}\right)^4 = \frac{3}{5} \cdot \frac{3}{5} \cdot \frac{3}{5} \cdot \frac{3}{5}$ $= \frac{3 \cdot 3 \cdot 3 \cdot 3}{5 \cdot 5 \cdot 5 \cdot 5}$ $= \frac{3^4}{5^4}$
precision The level of detail of a measurement, determined by the unit of measure.	**precisión** Detalle de una medición, determinado por la unidad de medida.	A ruler marked in millimeters has a greater level of precision than a ruler marked in centimeters.
prediction An estimate or guess about something that has not yet happened.	**predicción** Estimación o suposición sobre algo que todavía no ha sucedido.	
prime factorization A representation of a number or a polynomial as a product of primes.	**factorización prima** Representación de un número o de un polinomio como producto de números primos.	The prime factorization of 60 is $2 \cdot 2 \cdot 3 \cdot 5$.

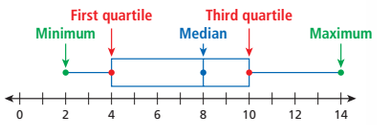
Glossary/Glossario **G27**

ENGLISH	SPANISH	EXAMPLES
prime number A whole number greater than 1 that has exactly two positive factors, itself and 1.	**número primo** Número cabal mayor que 1 que es divisible únicamente entre sí mismo y entre 1.	5 is prime because its only positive factors are 5 and 1.
principal An amount of money borrowed or invested.	**capital** Cantidad de dinero que se pide prestado o se invierte.	
prism A polyhedron formed by two parallel congruent polygonal bases connected by faces that are parallelograms.	**prisma** Poliedro formado por dos bases poligonales congruentes y paralelas conectadas por caras laterales que son paralelogramos.	
probability A number from 0 to 1 (or 0% to 100%) that is the measure of how likely an event is to occur.	**probabilidad** Número entre 0 y 1 (o entre 0% y 100%) que describe cuán probable es que ocurra un suceso.	A bag contains 3 red marbles and 4 blue marbles. The probability of randomly choosing a red marble is $\frac{3}{7}$.
Product of Powers Property If a is any nonzero real number and m and n are integers, then $a^m \cdot a^n = a^{m+n}$.	**Propiedad del producto de potencias** Dado un número real a distinto de cero y los números enteros m y n, entonces $a^m \cdot a^n = a^{m+n}$.	$6^7 \cdot 6^4 = 6^{7+4}$ $= 6^{11}$
Product Property of Square Roots For $a \geq 0$ and $b \geq 0$, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.	**Propiedad del producto de raíces cuadradas** Dados $a \geq 0$ y $b \geq 0$, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.	$\sqrt{9 \cdot 25} = \sqrt{9} \cdot \sqrt{25}$ $= 3 \cdot 5 = 15$
proportion A statement that two ratios are equal; $\frac{a}{b} = \frac{c}{d}$.	**proporción** Ecuación que establece que dos razones son iguales; $\frac{a}{b} = \frac{c}{d}$.	$\frac{2}{3} = \frac{4}{6}$
pyramid A polyhedron formed by a polygonal base and triangular lateral faces that meet at a common vertex.	**pirámide** Poliedro formado por una base poligonal y caras laterales triangulares que se encuentran en un vértice común.	
Pythagorean Theorem If a right triangle has legs of lengths a and b and a hypotenuse of length c, then $a^2 + b^2 = c^2$.	**Teorema de Pitágoras** Dado un triángulo rectángulo con catetos de longitudes a y b y una hipotenusa de longitud c, entonces $a^2 + b^2 = c^2$.	 $5^2 + 12^2 = 13^2$ $25 + 144 = 169$
Pythagorean triple A set of three positive integers a, b, and c such that $a^2 + b^2 = c^2$.	**Tripleta de Pitágoras** Conjunto de tres enteros positivos a, b y c tal que $a^2 + b^2 = c^2$.	The numbers 3, 4, and 5 form a Pythagorean triple because $3^2 + 4^2 = 5^2$.

Q

quadrant One of the four regions into which the x- and y-axes divide the coordinate plane.	**cuadrante** Una de las cuatro regiones en las que los ejes x e y dividen el plano cartesiano.	

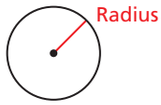
G28 Glossary/Glosario

ENGLISH	SPANISH	EXAMPLES
quadratic equation An equation that can be written in the form $ax^2 + bx + c = 0$, where a, b, and c are real numbers and $a \neq 0$.	**ecuación cuadrática** Ecuación que se puede expresar como $ax^2 + bx + c = 0$, donde a, b y c son números reales y $a \neq 0$.	$x^2 + 3x - 4 = 0$ $x^2 - 9 = 0$
Quadratic Formula The formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, which gives solutions, or roots, of equations in the form $ax^2 + bx + c = 0$, where $a \neq 0$.	**fórmula cuadrática** La fórmula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, que da soluciones, o raíces, para las ecuaciones del tipo $ax^2 + bx + c = 0$, donde $a \neq 0$.	The solutions of $2x^2 - 5x - 3 = 0$ are given by $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-3)}}{2(2)}$ $= \frac{5 \pm \sqrt{25 + 24}}{4} = \frac{5 \pm 7}{4}$ $x = 3$ or $x = -\frac{1}{2}$
quadratic function A function that can be written in the form $f(x) = ax^2 + bx + c$, where a, b, and c are real numbers and $a \neq 0$.	**función cuadrática** Función que se puede expresar como $f(x) = ax^2 + bx + c$, donde a, b y c son números reales y $a \neq 0$.	$f(x) = x^2 - 6x + 8$
quadratic polynomial A polynomial of degree 2.	**polinomio cuadrático** Polinomio de grado 2.	$x^2 - 6x + 8$
quartile The median of the upper or lower half of a data set. *See also* first quartile, third quartile.	**cuartil** La mediana de la mitad superior o inferior de un conjunto de datos. *Ver también* primer cuartil, tercer cuartil.	
Quotient of Powers Property If a is a nonzero real number and m and n are integers, then $\frac{a^m}{a^n} = a^{m-n}$.	**Propiedad del cociente de potencias** Dado un número real a distinto de cero y los números enteros m y n, entonces $\frac{a^m}{a^n} = a^{m-n}$.	$\frac{6^7}{6^4} = 6^{7-4} = 6^3$
Quotient Property of Square Roots For $a \geq 0$ and $b > 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$.	**Propiedad del cociente de raíces cuadradas** Dados $a \geq 0$ y $b > 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$.	$\sqrt{\frac{9}{25}} = \frac{\sqrt{9}}{\sqrt{25}} = \frac{3}{5}$

R

radical equation An equation that contains a variable within a radical.	**ecuación radical** Ecuación que contiene una variable dentro de un radical.	$\sqrt{x + 3} + 4 = 7$
radical expression An expression that contains a radical sign.	**expresión radical** Expresión que contiene un signo de radical.	$\sqrt{x + 3} + 4$
radical symbol The symbol $\sqrt{\ }$ used to denote a root. The symbol is used alone to indicate a square root or with an index, $\sqrt[n]{\ }$, to indicate the nth root.	**símbolo de radical** Símbolo $\sqrt{\ }$ que se utiliza para expresar una raíz. Puede utilizarse solo para indicar una raíz cuadrada, o con un índice, $\sqrt[n]{\ }$, para indicar la enésima raíz.	$\sqrt{36} = 6$ $\sqrt[3]{27} = 3$

Glossary/Glosario **G29**

ENGLISH	SPANISH	EXAMPLES
radicand The expression under a radical sign.	**radicando** Número o expresión debajo del signo de radical.	Expression: $\sqrt{x+3}$ Radicand: $x+3$
radius A segment whose endpoints are the center of a circle and a point on the circle; the distance from the center of a circle to any point on the circle.	**radio** Segmento cuyos extremos son el centro de un círculo y un punto de la circunferencia; distancia desde el centro de un círculo hasta cualquier punto de la circunferencia.	
random sample A sample selected from a population so that each member of the population has an equal chance of being selected.	**muestra aleatoria** Muestra seleccionada de una población tal que cada miembro de ésta tenga igual probabilidad de ser seleccionada.	Mr. Hansen chose a random sample of the class by writing each student's name on a slip of paper, mixing up the slips, and drawing five slips without looking.
range of a data set The difference of the greatest and least values in the data set.	**rango de un conjunto de datos** La diferencia del mayor y menor valor en un conjunto de datos.	The data set {3, 3, 5, 7, 8, 10, 11, 11, 12} has a range of $12 - 3 = 9$.
range of a function or relation The set of all second coordinates (or y-values) of a function or relation.	**rango de una función o relación** Conjunto de todos los valores de la segunda coordenada (o valores de y) de una función o relación.	The range of the function {(−5, 3), (−3, −2), (−1, −1), (1, 0)} is {−2, −1, 0, 3}.
rate A ratio that compares two quantities measured in different units.	**tasa** Razón que compara dos cantidades medidas en diferentes unidades.	$\frac{55 \text{ miles}}{1 \text{ hour}} = 55$ mi/h
rate of change A ratio that compares the amount of change in a dependent variable to the amount of change in an independent variable.	**tasa de cambio** Razón que compara la cantidad de cambio de la variable dependiente con la cantidad de cambio de la variable independiente.	The cost of mailing a letter increased from 22 cents in 1985 to 25 cents in 1988. During this period, the rate of change was $\frac{\text{change in cost}}{\text{change in year}} = \frac{25-22}{1988-1985} = \frac{3}{3}$ $= 1$ cent per year.
ratio A comparison of two quantities by division.	**razón** Comparación de dos cantidades mediante una división.	$\frac{1}{2}$ or 1:2
rational equation An equation that contains one or more rational expressions.	**ecuación racional** Ecuación que contiene una o más expresiones racionales.	$\frac{x+2}{x^2+3x-1} = 6$
rational exponent An exponent that can be expressedas $\frac{m}{n}$ such that if m and n are integers, then $b^{\frac{m}{n}} = \sqrt[n]{b^m} = \left(\sqrt[n]{b}\right)^m$.	**exponente racional** Exponente que se puede expresar como $\frac{m}{n}$ tal que si m y n son números enteros, entonces $b^{\frac{m}{n}} = \sqrt[n]{b^m} = \left(\sqrt[n]{b}\right)^m$.	$64^{\frac{1}{6}} = \sqrt[6]{64}$
rational expression An algebraic expression whose numerator and denominator are polynomials and whose denominator has a degree ≥ 1.	**expresión racional** Expresión algebraica cuyo numerador y denominador son polinomios y cuyo denominador tiene un grado ≥ 1.	$\frac{x+2}{x^2+3x-1}$

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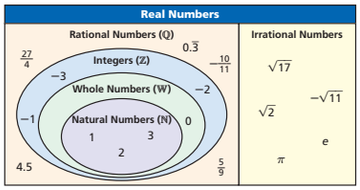
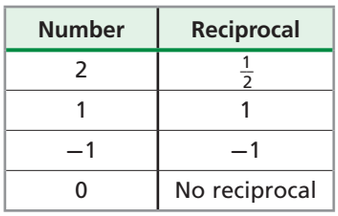
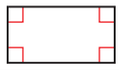
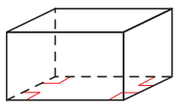
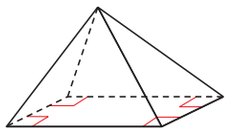
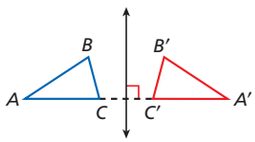
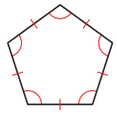
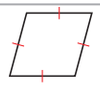
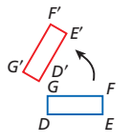
ENGLISH	SPANISH	EXAMPLES
rational function A function whose rule can be written as a rational expression.	**función racional** Función cuya regla se puede expresar como una expresión racional.	$f(x) = \dfrac{x+2}{x^2+3x-1}$
rational number A number that can be written in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$.	**número racional** Número que se puede expresar como $\frac{a}{b}$, donde a y b son números enteros y $b \neq 0$.	$3,\ 1.75,\ 0.\overline{3},\ -\frac{2}{3},\ 0$
rationalizing the denominator A method of rewriting a fraction by multiplying by another fraction that is equivalent to 1 in order to remove radical terms from the denominator.	**racionalizar el denominador** Método que consiste en escribir nuevamente una fracción multiplicándola por otra fracción equivalente a 1 a fin de eliminar los términos radicales del denominador.	$\dfrac{1}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{\sqrt{2}}{2}$
ray A part of a line that starts at an endpoint and extends forever in one direction.	**rayo** Parte de una recta que comienza en un extremo y se extiende infinitamente en una dirección.	
real number A rational or irrational number. Every point on the number line represents a real number.	**número real** Número racional o irracional. Cada punto de la recta numérica representa un número real.	
reciprocal For a real number $a \neq 0$, the reciprocal of a is $\frac{1}{a}$. The product of reciprocals is 1.	**recíproco** Dado el número real $a \neq 0$, el recíproco de a es $\frac{1}{a}$. El producto de los recíprocos es 1.	

Number	Reciprocal
2	$\frac{1}{2}$
1	1
−1	−1
0	No reciprocal

rectangle A quadrilateral with four right angles.	**rectángulo** Cuadrilátero con cuatro ángulos rectos.	
rectangular prism A prism whose bases are rectangles.	**prisma rectangular** Prisma cuyas bases son rectángulos.	
rectangular pyramid A pyramid whose base is a rectangle.	**pirámide rectangular** Pirámide cuya base es un rectángulo.	
reflection A transformation that reflects, or "flips," a graph or figure across a line, called the line of reflection.	**reflexión** Transformación en la que una gráfica o figura se refleja o se invierte sobre una línea, denominada la línea de reflexión.	
regular polygon A polygon that is both equilateral and equiangular.	**polígono regular** Polígono equilátero de ángulos iguales.	

Glossary/Glosario **G31**

ENGLISH	SPANISH	EXAMPLES
relation A set of ordered pairs.	**relación** Conjunto de pares ordenados.	$\{(0, 5), (0, 4), (2, 3), (4, 0)\}$
repeating decimal A rational number in decimal form that has a nonzero block of one or more digits that repeat continuously.	**decimal periódico** Número racional en forma decimal que tiene un bloque de uno o más dígitos que se repite continuamente.	$1.\overline{3}$, $0.\overline{6}$, $2.\overline{14}$, $6.77\overline{3}$
replacement set A set of numbers that can be substituted for a variable.	**conjunto de reemplazo** Conjunto de números que pueden sustituir una variable.	
residual The signed vertical distance between a data point and a line of fit.	**residuo** La diferencia vertical entre un dato y una línea de ajuste.	
rhombus A quadrilateral with four congruent sides.	**rombo** Cuadrilátero con cuatro lados congruentes.	
right angle An angle that measures 90°.	**ángulo recto** Ángulo que mide 90°.	
rise The difference in the y-values of two points on a line.	**distancia vertical** Diferencia entre los valores de y de dos puntos de una línea.	For the points $(3, -1)$ and $(6, 5)$, the rise is $5 - (-1) = 6$.
rotation A transformation that rotates or turns a figure about a point called the center of rotation.	**rotación** Transformación que rota o gira una figura sobre un punto llamado centro de rotación.	
run The difference in the x-values of two points on a line.	**distancia horizontal** Diferencia entre los valores de x de dos puntos de una línea.	For the points $(3, -1)$ and $(6, 5)$, the run is $6 - 3 = 3$.
S		
sample A part of the population.	**muestra** Una parte de la población.	In a survey about the study habits of high school students, a sample is a survey of 100 students.
sample space The set of all possible outcomes of a probability experiment.	**espacio muestral** Conjunto de todos los resultados posibles de un experimento de probabilidad.	In the experiment of rolling a number cube, the sample space is {1, 2, 3, 4, 5, 6}.
scale The ratio between two corresponding measurements.	**escala** Razón entre dos medidas correspondientes.	1 cm : 5 mi

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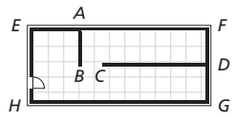
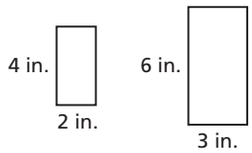
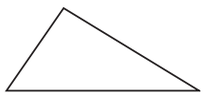
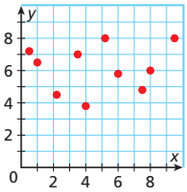
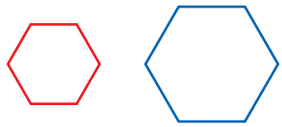
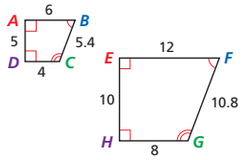
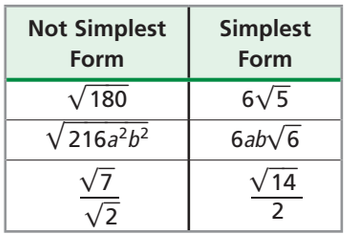
ENGLISH	SPANISH	EXAMPLES
scale drawing A drawing that uses a scale to represent an object as smaller or larger than the actual object.	**dibujo a escala** Dibujo que utiliza una escala para representar un objeto como más pequeño o más grande que el objeto original.	 A blueprint is an example of a scale drawing.
scale factor The multiplier used on each dimension to change one figure into a similar figure.	**factor de escala** El multiplicador utilizado en cada dimensión para transformar una figura en una figura semejante.	 Scale factor: $\frac{3}{2} = 1.5$
scale model A three-dimensional model that uses a scale to represent an object as smaller or larger than the actual object.	**modelo a escala** Modelo tridimensional que utiliza una escala para representar un objeto como más pequeño o más grande que el objeto real.	
scalene triangle A triangle with no congruent sides.	**triángulo escaleno** Triángulo sin lados congruentes.	
scatter plot A graph with points plotted to show a possible relationship between two sets of data.	**diagrama de dispersión** Gráfica con puntos que se usa para demostrar una relación posible entre dos conjuntos de datos.	
second differences Differences between first differences of a function.	**segundas diferencias** Diferencias entre las primeras diferencias de una función.	Constant change in x-values +1 +1 +1 +1 x: 0 1 2 3 4 $y = x^2$: 0 1 4 9 16 First differences +1 +3 +5 +7 Second differences +2 +2 +2
sequence A list of numbers that often form a pattern.	**sucesión** Lista de números que generalmente forman un patrón.	1, 2, 4, 8, 16, …
set A collection of items called elements.	**conjunto** Grupo de componentes denominados elementos.	{1, 2, 3}
set-builder notation A notation for a set that uses a rule to describe the properties of the elements of the set.	**notación de conjuntos** Notación para un conjunto que se vale de una regla para describir las propiedades de los elementos del conjunto.	$\{x \mid x > 3\}$ is read "The set of all x such that x is greater than 3."

Glossary/Glossario **G33**

ENGLISH	SPANISH	EXAMPLES
similar Two figures are similar if they have the same shape but not necessarily the same size.	**semejantes** Dos figuras con la misma forma pero no necesariamente del mismo tamaño.	
similarity statement A statement that indicates that two polygons are similar by listing the vertices in the order of correspondence.	**enunciado de semejanza** Enunciado que indica que dos polígonos son semejantes enumerando los vértices en orden de correspondencia.	 quadrilateral *ABCD* ~ quadrilateral *EFGH*
simple event An event consisting of only one outcome.	**suceso simple** Suceso que tiene sólo un resultado.	In the experiment of rolling a number cube, the event consisting of the outcome 3 is a simple event.
simple interest A fixed percent of the principal. For principal P, interest rate r, and time t in years, the simple interest is $I = Prt$.	**interés simple** Porcentaje fijo del capital. Dado el capital P, la tasa de interés r y el tiempo t expresado en años, el interés simple es $I = Prt$.	If \$100 is put into an account with a simple interest rate of 5%, then after 2 years, the account will have earned $I = 100 \cdot 0.05 \cdot 2 = \$10$ in interest.
simplest form of a square root expression A square root expression is in simplest form if it meets the following criteria: 1. No perfect squares are in the radicand. 2. No fractions are in the radicand. 3. No square roots appear in the denominator of a fraction. *See also* rationalizing the denominator.	**forma simplificada de una expresión de raíz cuadrada** Una expresión de raíz cuadrada está en forma simplificada si reúne los siguientes requisitos: 1. No hay cuadrados perfectos en el radicando. 2. No hay fracciones en el radicando. 3. No aparecen raíces cuadradas en el denominador de una fracción. *Ver también* racionalizar el denominador.	
simplest form of a rational expression A rational expression is in simplest form if the numerator and denominator have no common factors.	**forma simplificada de una expresión racional** Una expresión racional está en forma simplificada cuando el numerador y el denominador no tienen factores comunes.	$\frac{x^2 - 1}{x^2 + x - 2} = \frac{(x - 1)(x + 1)}{(x - 1)(x + 2)} = \frac{x + 1}{x + 2}$ ↑ Simplest form

Not Simplest Form	Simplest Form
$\sqrt{180}$	$6\sqrt{5}$
$\sqrt{216a^2b^2}$	$6ab\sqrt{6}$
$\frac{\sqrt{7}}{\sqrt{2}}$	$\frac{\sqrt{14}}{2}$

G34 *Glossary/Glosario*

ENGLISH	SPANISH	EXAMPLES

simplest form of an exponential expression An exponential expression is in simplest form if it meets the following criteria:

1. There are no negative exponents.
2. The same base does not appear more than once in a product or quotient.
3. No powers, products, or quotients are raised to powers.
4. Numerical coefficients in a quotient do not have any common factor other than 1.

forma simplificada de una expresión exponencial Una expresión exponencial está en forma simplificada si reúne los siguientes requisitos:

1. No hay exponentes negativos.
2. La misma base no aparece más de una vez en un producto o cociente.
3. No se elevan a potencias productos, cocientes ni potencias.
4. Los coeficientes numéricos en un cociente no tienen ningún factor común que no sea 1.

Not Simplest Form	Simplest Form
$7^8 \cdot 7^4$	7^{12}
$(x^2)^{-4} \cdot x^5$	$\frac{1}{x^3}$
$\frac{a^5b^9}{(ab)^4}$	ab^5

---

simplify To perform all indicated operations.

simplificar Realizar todas las operaciones indicadas.

$13 - 20 + 8$
$-7 + 8$
1

---

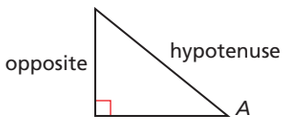
simulation A model of an experiment, often one that would be too difficult or time-consuming to actually perform.

simulación Modelo de un experimento; generalmente se recurre a la simulación cuando realizar dicho experimento sería demasiado difícil o llevaría mucho tiempo.

---

sine In a right triangle, the ratio of the length of the leg opposite $\angle A$ to the length of the hypotenuse.

seno En un triángulo rectángulo, razón entre la longitud del cateto opuesto a $\angle A$ y la longitud de la hipotenusa.

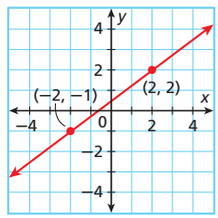


$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

---

slope A measure of the steepness of a line. If (x_1, y_1) and (x_2, y_2) are any two points on the line, the slope of the line, known as m, is represented by the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$.

pendiente Medida de la inclinación de una línea. Dados dos puntos (x_1, y_1) y (x_2, y_2) en una línea, la pendiente de la línea, denominada m, se representa con la ecuación $m = \frac{y_2 - y_1}{x_2 - x_1}$.



$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 2}{-2 - 2} = \frac{3}{4}$$

---

slope-intercept form The slope-intercept form of a linear equation is $y = mx + b$, where m is the slope and b is the y-intercept.

forma de pendiente-intersección La forma de pendiente-intersección de una ecuación lineal es $y = mx + b$, donde m es la pendiente y b es la intersección con el eje y.

$y = -2x + 4$
The slope is -2.
The y-intercept is 4.

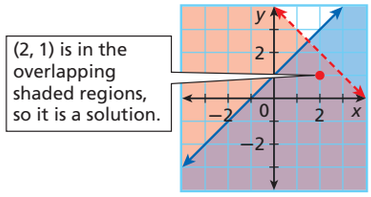
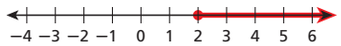
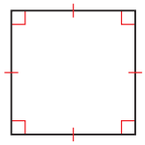
---

solution of a linear equation in two variables An ordered pair or ordered pairs that make the equation true.

solución de una ecuación lineal en dos variables Un par ordenado o pares ordenados que hacen que la ecuación sea verdadera.

(4, 2) is a solution of $x + y = 6$.

Glossary/Glosario **G35**

ENGLISH	SPANISH	EXAMPLES
solution of a linear inequality in two variables An ordered pair or ordered pairs that make the inequality true.	**solución de una desigualdad lineal en dos variables** Un par ordenado o pares ordenados que hacen que la desigualdad sea verdadera.	(3, 1) is a solution of $x + y < 6$.
solution of a system of linear equations Any ordered pair that satisfies all the equations in a system.	**solución de un sistema de ecuaciones lineales** Cualquier par ordenado que resuelva todas las ecuaciones de un sistema.	$\begin{cases} x + y = -1 \\ -x + y = -3 \end{cases}$ Solution: $(1, -2)$
solution of a system of linear inequalities Any ordered pair that satisfies all the inequalities in a system.	**solución de un sistema de desigualdades lineales** Cualquier par ordenado que resuelva todas las desigualdades de un sistema.	$\begin{cases} y \le x + 1 \\ y < -x + 4 \end{cases}$ 
solution of an equation in one variable A value or values that make the equation true.	**solución de una ecuación en una variable** Valor o valores que hacen que la ecuación sea verdadera.	Equation: $x + 2 = 6$ Solution: $x = 4$
solution of an inequality in one variable A value or values that make the inequality true.	**solución de una desigualdad en una variable** Valor o valores que hacen que la desigualdad sea verdadera.	Inequality: $x + 2 < 6$ Solution: $x < 4$
solution set The set of values that make a statement true.	**conjunto solución** Conjunto de valores que hacen verdadero un enunciado.	Inequality: $x + 3 \ge 5$ Solution set: $\{x \mid x \ge 2\}$ 
square A quadrilateral with four congruent sides and four right angles.	**cuadrado** Cuadrilátero con cuatro lados congruentes y cuatro ángulos rectos.	
square in numeration The second power of a number.	**cuadrado en numeración** La segunda potencia de un número.	16 is the square of 4.
standard form of a linear equation $Ax + By = C$, where A, B, and C are real numbers and A and B are not both 0.	**forma estándar de una ecuación lineal** $Ax + By = C$, donde A, B y C son números reales y A y B no son ambos cero.	$2x + 3y = 6$
standard form of a polynomial A polynomial in one variable is written in standard form when the terms are in order from greatest degree to least degree.	**forma estándar de un polinomio** Un polinomio de una variable se expresa en forma estándar cuando los términos se ordenan de mayor a menor grado.	$4x^5 - 2x^4 + x^2 - x + 1$

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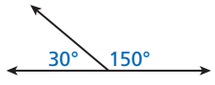
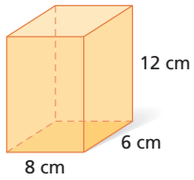
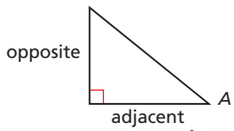
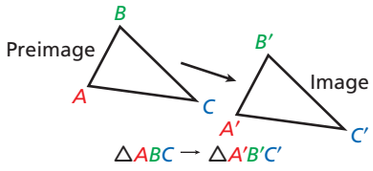
ENGLISH	SPANISH	EXAMPLES
standard form of a quadratic equation $ax^2 + bx + c = 0$, where a, b, and c are real numbers and $a \neq 0$.	**forma estándar de una ecuación cuadrática** $ax^2 + bx + c = 0$, donde a, b y c son números reales y $a \neq 0$.	$2x^2 + 3x - 1 = 0$
stem-and-leaf plot A graph used to organize and display data by dividing each data value into two parts, a stem and a leaf.	**diagrama de tallo y hojas** Gráfica utilizada para organizar y mostrar datos dividiendo cada valor de datos en dos partes, un tallo y una hoja.	Stem | Leaves 3 | 2 3 4 4 7 9 4 | 0 1 5 7 7 7 8 5 | 1 2 2 3 *Key: 3|2 means 3.2*
stratified random sample A sample in which a population is divided into distinct groups and members are selected at random from each group.	**muestra aleatoria estratificada** Muestra en la que la población está dividida en grupos diferenciados y los miembros de cada grupo se seleccionan al azar.	Ms. Carter chose a stratified random sample of her school's student population by randomly selecting 30 students from each grade level.
subset A set that is contained entirely within another set. Set B is a subset of set A if every element of B is contained in A, denoted $B \subset A$.	**subconjunto** Conjunto que se encuentra dentro de otro conjunto. El conjunto B es un subconjunto del conjunto A si todos los elementos de B son elementos de A; se expresa $B \subset A$.	The set of integers is a subset of the set of rational numbers.
substitution method A method used to solve systems of equations by solving an equation for one variable and substituting the resulting expression into the other equation(s).	**sustitución** Método utilizado para resolver sistemas de ecuaciones resolviendo una ecuación para una variable y sustituyendo la expresión resultante en las demás ecuaciones.	
Subtraction Property of Equality If a, b, and c are real numbers and $a = b$, then $a - c = b - c$.	**Propiedad de igualdad de la resta** Si a, b y c son números reales y $a = b$, entonces $a - c = b - c$.	$x + 6 = 8$ $-6 \quad -6$ $x = 2$
Subtraction Property of Inequality For real numbers a, b, and c, if $a < b$, then $a - c < b - c$. Also holds true for $>$, $\leq$, $\geq$, and $\neq$.	**Propiedad de desigualdad de la resta** Dados los números reales a, b y c, si $a < b$, entonces $a - c < b - c$. Es válido también para $>$, $\leq$, $\geq$ y $\neq$.	$x + 6 < 8$ $-6 \quad -6$ $x < 2$
supplementary angles Two angles whose measures have a sum of 180°.	**ángulos suplementarios** Dos ángulos cuyas medidas suman 180°.	
surface area The total area of all faces and curved surfaces of a three-dimensional figure.	**área total** Área total de todas las caras y superficies curvas de una figura tridimensional.	 Surface area $= 2(8)(12) + 2(8)(6) + 2(12)(6)$ $= 432 \text{ cm}^2$

Glossary/Glosario **G37**

ENGLISH	SPANISH	EXAMPLES
system of linear equations A system of equations in which all of the equations are linear.	**sistema de ecuaciones lineales** Sistema de ecuaciones en el que todas las ecuaciones son lineales.	$\begin{cases} 2x + 3y = -1 \\ x - 3y = 4 \end{cases}$
system of linear inequalities A system of inequalities in which all of the inequalities are linear.	**sistema de desigualdades lineales** Sistema de desigualdades en el que todas las desigualdades son lineales.	$\begin{cases} 2x + 3y > -1 \\ x - 3y \leq 4 \end{cases}$
systematic random sample A sample based on selecting one member of the population at random and then selecting other members by using a pattern.	**muestra sistemática** Muestra en la que se elige a un miembro de la población al azar y luego se elige a otros miembros mediante un patrón.	Mr. Martin chose a systematic random sample of customers visiting a store by selecting one customer at random and then selecting every tenth customer after that.

T

tangent In a right triangle, the ratio of the length of the leg opposite $\angle A$ to the length of the leg adjacent to $\angle A$.	**tangente** En un triángulo rectángulo, razón entre la longitud del cateto opuesto a $\angle A$ y la longitud del cateto adyacente a $\angle A$.	 $\tan A = \frac{\text{opposite}}{\text{adjacent}}$
term of an expression The parts of the expression that are added or subtracted.	**término de una expresión** Parte de una expresión que debe sumarse o restarse.	$3x^2 + 6x - 8$ Term Term Term
term of a sequence An element or number in the sequence.	**término de una sucesión** Elemento o número de una sucesión.	5 is the third term in the sequence 1, 3, 5, 7, …
terminating decimal A decimal that ends, or terminates.	**decimal finito** Decimal con un número determinados de posiciones decimales.	1.5, 2.75, 4.0
theoretical probability The ratio of the number of equally likely outcomes in an event to the total number of possible outcomes.	**probabilidad teórica** Razón entre el número de resultados igualmente probables de un suceso y el número total de resultados posibles.	In the experiment of rolling a number cube, the theoretical probability of rolling an odd number is $\frac{3}{6} = \frac{1}{2}$.
third quartile The median of the upper half of a data set. Also called *upper quartile.*	**tercer cuartil** La mediana de la mitad superior de un conjunto de datos. También se llama *cuartil superior.*	**Lower half** **Upper half** 18, 23, 28, 29, 36, 42 **Third quartile**
tolerance The amount by which a measurement is permitted to vary from a specified value.	**tolerancia** La cantidad por que una medida se permite variar de un valor especificado.	
transformation A change in the position, size, or shape of a figure or graph.	**transformación** Cambio en la posición, tamaño o forma de una figura o gráfica.	

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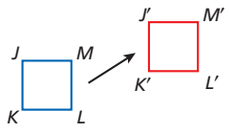
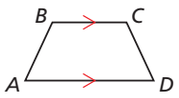
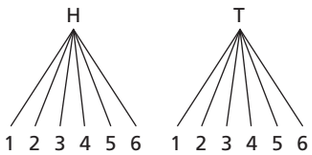
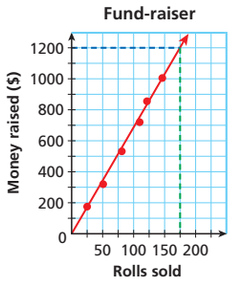
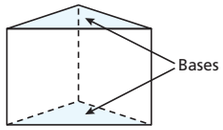
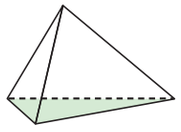
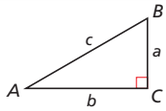
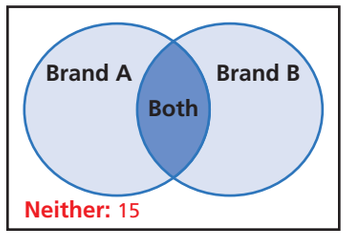
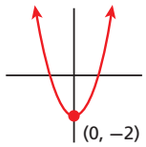
ENGLISH	SPANISH	EXAMPLES
translation A transformation that shifts or slides every point of a figure or graph the same distance in the same direction.	**traslación** Transformación en la que todos los puntos de una figura o gráfica se mueven la misma distancia en la misma dirección.	
trapezoid A quadrilateral with exactly one pair of parallel sides.	**trapecio** Cuadrilátero con sólo un par de lados paralelos.	
tree diagram A branching diagram that shows all possible combinations or outcomes of an experiment.	**diagrama de árbol** Diagrama con ramificaciones que muestra todas las combinaciones o resultados posibles de un experimento.	 The tree diagram shows the possible outcomes when tossing a coin and rolling a number cube.
trend line A line on a scatter plot that helps show the correlation between data sets more clearly.	**línea de tendencia** Línea en un diagrama de dispersión que sirve para mostrar la correlación entre conjuntos de datos más claramente.	
trial Each repetition or observation of an experiment.	**prueba** Una sola repetición u observación de un experimento.	In the experiment of rolling a number cube, each roll is one trial.
triangle A three-sided polygon.	**triángulo** Polígono de tres lados.	
triangular prism A prism whose bases are triangles.	**prisma triangular** Prisma cuyas bases son triángulos.	
triangular pyramid A pyramid whose base is a triangle.	**pirámide triangular** Pirámide cuya base es un triángulo.	
trigonometric ratio Ratio of the lengths of two sides of a right triangle.	**razón trigonométrica** Razón entre dos lados de un triángulo rectángulo.	 $\sin A = \frac{a}{c}$, $\cos A = \frac{b}{c}$, $\tan A = \frac{a}{b}$
trinomial A polynomial with three terms.	**trinomio** Polinomio con tres términos.	$4x^2 + 3xy - 5y^2$

Glossary/Glosario **G39**

ENGLISH	SPANISH	EXAMPLES
U		
union The union of two sets is the set of all elements that are in either set, denoted by ∪.	**unión** La unión de dos conjuntos es el conjunto de todos los elementos que se encuentran en ambos conjuntos, expresado por ∪.	$A = \{1, 2, 3, 4\}$ $B = \{1, 3, 5, 7, 9\}$ $A \cup B = \{1, 2, 3, 4, 5, 7, 9\}$
unit rate A rate in which the second quantity in the comparison is one unit.	**tasa unitaria** Tasa en la que la segunda cantidad de la comparación es una unidad.	$\frac{30 \text{ mi}}{1 \text{ h}} = 30 \text{ mi/h}$
unlike radicals Radicals with a different quantity under the radical.	**radicales distintos** Radicales con cantidades diferentes debajo del signo de radical.	$2\sqrt{2}$ and $2\sqrt{3}$
unlike terms Terms with different variables or the same variables raised to different powers.	**términos distintos** Términos con variables diferentes o las mismas variables elevadas a potencias diferentes.	$4xy^2$ and $6x^2y$
upper quartile *See* third quartile.	**cuartil superior** *Ver* tercer cuartil.	
V		
value of a function The result of replacing the independent variable with a number and simplifying.	**valor de una función** Resultado de reemplazar la variable independiente por un número y luego simplificar.	The value of the function $f(x) = x + 1$ for $x = 3$ is 4.
value of a variable A number used to replace a variable to make an equation true.	**valor de una variable** Número utilizado para reemplazar una variable y hacer que una ecuación sea verdadera.	In the equation $x + 1 = 4$, the value of x is 3.
value of an expression The result of replacing the variables in an expression with numbers and simplifying.	**valor de una expresión** Resultado de reemplazar las variables de una expresión por un número y luego simplificar.	The value of the expression $x + 1$ for $x = 3$ is 4.
variable A symbol used to represent a quantity that can change.	**variable** Símbolo utilizado para representar una cantidad que puede cambiar.	In the expression $2x + 3$, x is the variable.
Venn diagram A diagram used to show relationships between sets.	**diagrama de Venn** Diagrama utilizado para mostrar la relación entre conjuntos.	
vertex of a parabola The highest or lowest point on the parabola.	**vértice de una parábola** Punto más alto o más bajo de una parábola.	 The vertex is $(0, -2)$.

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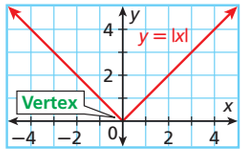
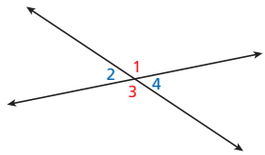
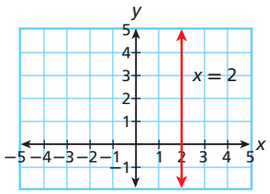
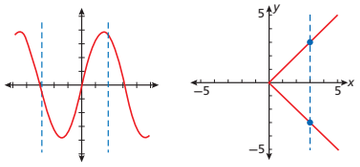
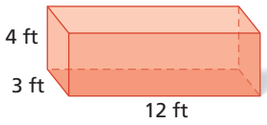
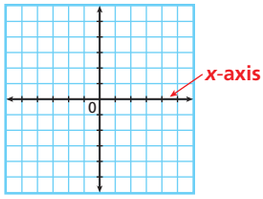
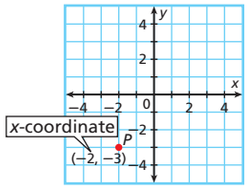
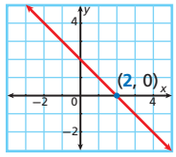
ENGLISH	SPANISH	EXAMPLES
vertex of an absolute-value graph The point on the axis of symmetry of the graph.	**vértice de una gráfica de valor absoluto** Punto en el eje de simetría de la gráfica.	
vertical angles The nonadjacent angles formed by two intersecting lines.	**ángulos opuestos por el vértice** Ángulos no adyacentes formados por dos líneas que se cruzan.	 ∠1 and ∠3 are vertical angles. ∠2 and ∠4 are vertical angles.
vertical line A line whose equation is $x = a$, where a is the x-intercept.	**línea vertical** Línea cuya ecuación es $x = a$, donde a es la intersección con el eje x.	
vertical-line test A test used to determine whether a relation is a function. If any vertical line crosses the graph of a relation more than once, the relation is not a function.	**prueba de la línea vertical** Prueba utilizada para determinar si una relación es una función. Si una línea vertical corta la gráfica de una relación más de una vez, la relación no es una función.	 Function Not a function
volume The number of nonoverlapping unit cubes of a given size that will exactly fill the interior of a three-dimensional figure.	**volumen** Cantidad de cubos unitarios no superpuestos de un determinado tamaño que llenan exactamente el interior de una figura tridimensional.	 Volume = (3)(4)(12) = 144 ft^3
voluntary response sample A sample in which members choose to be in the sample.	**muestra de respuesta voluntaria** Una muestra en la que los miembros eligen participar.	A store provides survey cards for customers who wish to fill them out.

W

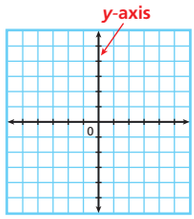
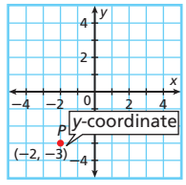
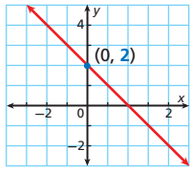
whole number A member of the set of natural numbers and zero.	**número cabal** Miembro del conjunto de los números naturales y cero.	0, 1, 2, 3, 4, 5, …

X

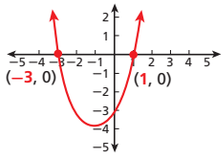
***x*-axis** The horizontal axis in a coordinate plane.	**eje *x*** Eje horizontal en un plano cartesiano.	

ENGLISH	SPANISH	EXAMPLES
x-coordinate The first number in an ordered pair, which indicates the horizontal distance of a point from the origin on the coordinate plane.	**coordenada *x*** Primer número de un par ordenado, que indica la distancia horizontal de un punto desde el origen en un plano cartesiano.	
x-intercept The x-coordinate(s) of the point(s) where a graph intersects the x-axis.	**intersección con el eje *x*** Coordenada(s) x de uno o más puntos donde una gráfica corta el eje x.	 The x-intercept is 2.

Y

y-axis The vertical axis in a coordinate plane.	**eje *y*** Eje vertical en un plano cartesiano.	
y-coordinate The second number in an ordered pair, which indicates the vertical distance of a point from the origin on the coordinate plane.	**coordenada *y*** Segundo número de un par ordenado, que indica la distancia vertical de un punto desde el origen en un plano cartesiano.	
y-intercept The y-coordinate(s) of the point(s) where a graph intersects the y-axis.	**intersección con el eje *y*** Coordenada(s) y de uno o más puntos donde una gráfica corta el eje y.	 The y-intercept is 2.

Z

zero exponent For any nonzero real number x, $x^0 = 1$.	**exponente cero** Dado un número real distinto de cero x, $x^0 = 1$.	$5^0 = 1$
zero of a function For the function f, any number x such that $f(x) = 0$.	**cero de una función** Dada la función f, todo número x tal que $f(x) = 0$.	 The zeros are −3 and 1.
Zero Product Property For real numbers p and q, if $pq = 0$, then $p = 0$ or $q = 0$.	**Propiedad del producto cero** Dados los números reales p y q, si $pq = 0$, entonces $p = 0$ o $q = 0$.	If $(x - 1)(x + 2) = 0$, then $x - 1 = 0$ or $x + 2 = 0$, so $x = 1$ or $x = -2$.

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